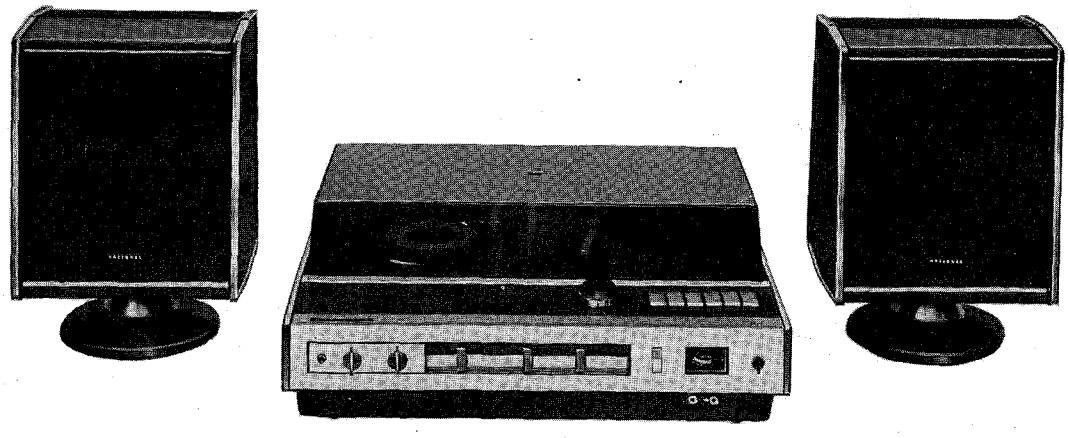
ORDER NO. SDT-161

NATIONAL Service Manual

AM/FM MULTIPLEX STEREO RADIO-PHONO WITH STEREO CASSETTE TAPE RECORDER

MODEL SG-990A



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SPECIFICATIONS

Frequency Range:	FM 87.5 ~ 108 MHz
	AM 525 ~ 1605 kHz
Intermediate Frequency:	FM 10.7 MHz
	AM 455 kHz
Transistors:	2SK19 FM RF Amplifier
	2SC920 FM Mixer
	2SC829 FM Oscillator
	2SC829 Composite
	2SC829 19 kHz Amplifier
	2SA101 38 kHz Amplifier
	2SC829 DC Amplifier
	2SB178 Eye Switching
	2SA564 Squelch & 1st AF Amplifier (two)
	2SB346 2nd AF Amplifier (two)
	2SB176 Driver (two)
	2SB473 Power Output (four)
	2SB175 AC Bias Oscillator
	2SB324 AC Bias Amplifier
	2SB346 Equalizer Pre Amplifier (two)
	2SB175 Equalizer Pre Amplifier (two)
Integrated Circuit:	AN-203
Diodes:	SC-15 AFC
	0A90 AM D.AGC
	0A90 AM Detector
	0A90 FM Detector } (pair)
	0A90 FM Detector
	0A90 Doubler } (pair)
	0A90 Doubler
	0A90 FM MPX } (two pairs)
	0A90 FM MPX
	0A90 LEVEL METER Detector
	1S1211 AOC
	10DC-1 Rectifier
	10DC-1R Rectifier
	12B-2-BIP-M Rectifier
Sensitivity:	FM 3μV/50 mW for 30 dB Quieting
	AM 100μV/m for 50 mW Output
Power Output:	9W – 9W (P.M.P.O.)
Power Source:	AC 110V, 125V, 210V, 240V 50 ~ 60 Hz
Speakers:	Two 6-1/2" PM Dynamic (16Ω)
Phono:	
Record Changer:	FA-707A
Cartridge:	EPS-34TTCD Magnistate, with Stylus
Stylus:	EPS-13TTSD Flip-over, Diamond
Phonomotor:	AC Motor (120V 60 Hz) 4 speed
Tape Deck:	
Recording System:	AC Bias 53 kHz
Erasure System:	AC Erase
Tape Speed:	4.75 cm/sec.
Frequency Response:	50 ~ 10000 Hz
Record/Playback Head:	WY-425Z
Erase Head:	WY-235X
Cassette Motor:	MHT-5PS
Cabinet Dimensions:	Tuner Cabinet 19" (W) x 7-11/16" (H) x 15-3/8" (D), 483 (W) x 391 (D) x 179 (H) mm Speaker System 9-1/8" (W) x 13-9/16" (H) x 7-1/2" (D)
Weight:	Tuner Cabinet 8.6 kg (18 lb. 15 oz) Speaker System 2 kg x 2 (4 lb. 6-1/2 oz x 2)

PARTS IDENTIFICATION

REPLACEMENT PARTS
Main Cabinet, Complete (SYK-710)
Speaker System, Complete (SYK-706)

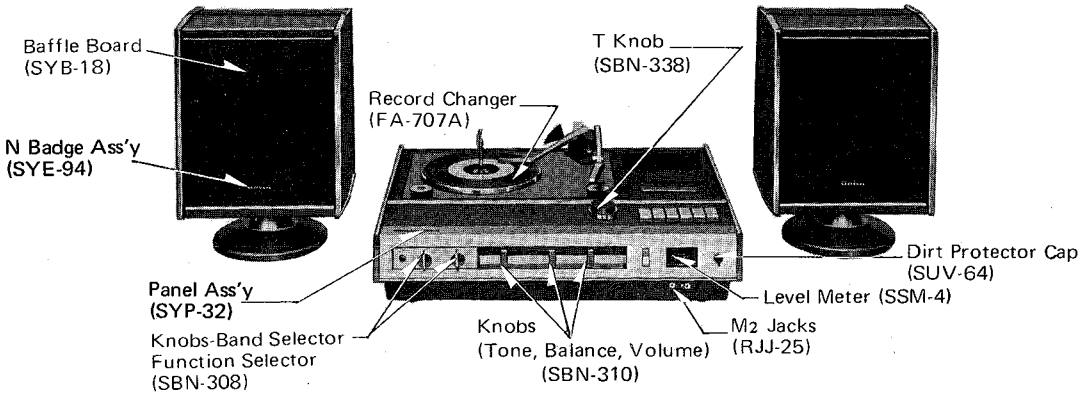


Fig. 1 TOP VIEW

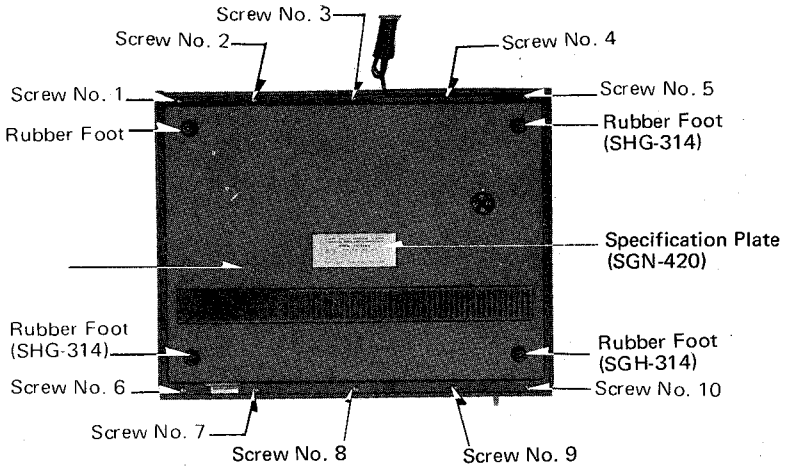


Fig. 2 BOTTOM VIEW

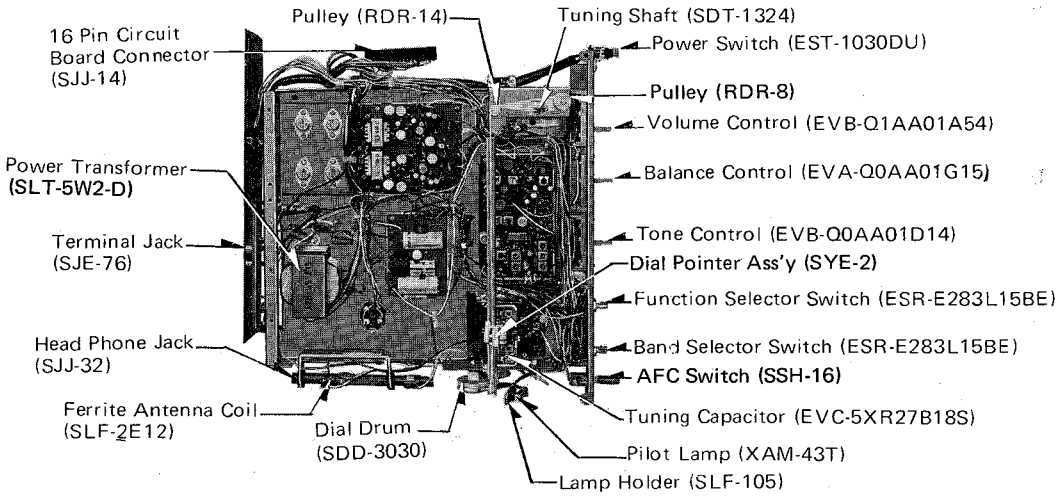


Fig. 3 CHASSIS

DISASSEMBLY INSTRUCTIONS

To Remove Chassis (Refer to Figs. 1, 2 and 4)

1. Remove six (6) knobs from panel.
2. Remove ten (10) bottom cover mounting screws, Nos. 1-10 as shown in Fig. 2.
3. Unscrew jack nut from head phone jack.
4. Remove six (6) chassis red mounting screws, Nos. 1-6 as shown in Fig. 4.
5. Unplug receptacle housing from plug housing, 2 pin plugs from changer jacks, 2 pin plug from 2 pin jack and 16 pin circuit board connector from cassette circuit board.
6. To reassemble, reverse above procedure.

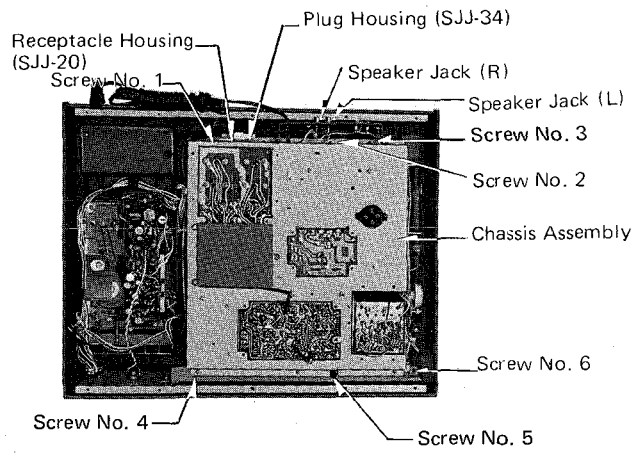


Fig. 4

To Remove Cassette Tape Deck (Refer to Figs. 2 and 5)

1. Remove ten (10) bottom cover mounting screws, Nos. 1-10 as shown in Fig. 2.
2. Unplug 16 pin circuit board connector from cassette circuit board.
3. Remove four (4) cassette tape deck red mounting screws, Nos. 1-4 and level meter mounting screw as shown in Fig. 5.
4. To reassemble, reverse above procedure.

To Remove Record Changer (Refer to Fig. 5)

1. Follow instruction 1 to 5 above. (Chassis Removal)
2. Remove four (4) changer mounting circlips and washers, as shown in Fig. 5.
3. To reassemble, reverse above procedure.

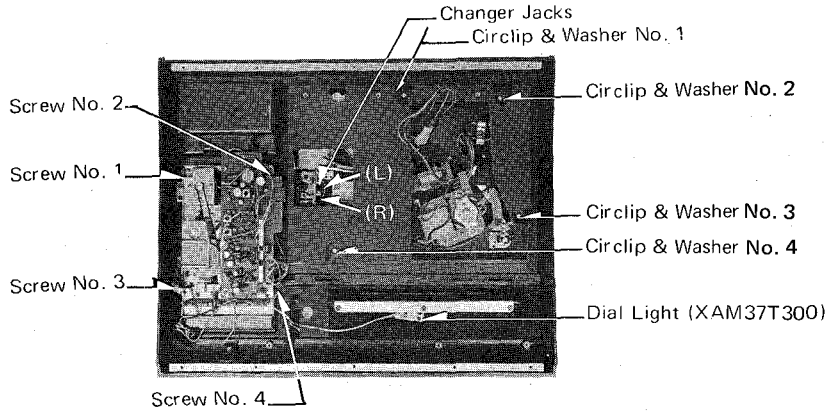


Fig. 5

DISASSEMBLY INSTRUCTIONS

To Remove Speaker (Refer to Figs. 6 and 7)

1. Remove four (4) rear cover mounting screws, Nos. 1-4, as shown in Fig. 6.
2. Unsolder wires from speaker terminal.
3. Remove four (4) speaker mounting nuts, Nos. 7-10, as shown in Fig. 7.
4. To reassemble, reverse above procedure.

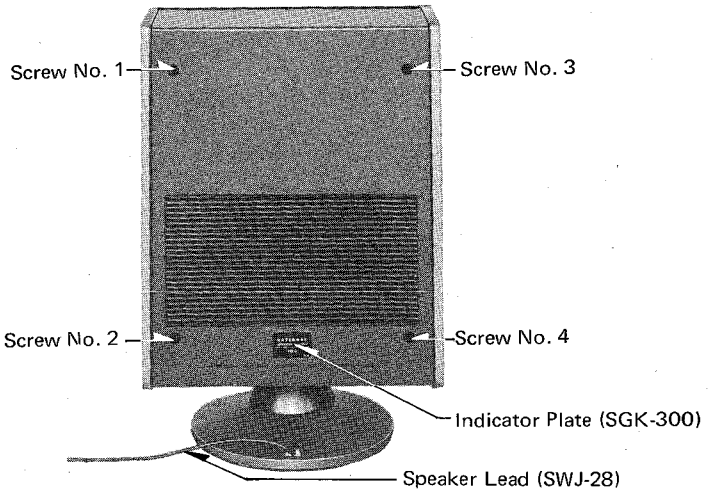


Fig. 6

To Remove Baffle Board
(Refer to Figs. 6 and 7)

1. Remove four (4) rear cover mounting screws, Nos. 1-4, as shown in Fig. 6.
2. Remove four (4) speaker mounting nuts, Nos. 7-10, as shown in Fig. 6.
3. Remove six (6) baffle board mounting nuts, Nos. 1-6, as shown in Fig. 7.
4. To reassemble, reverse above procedure.

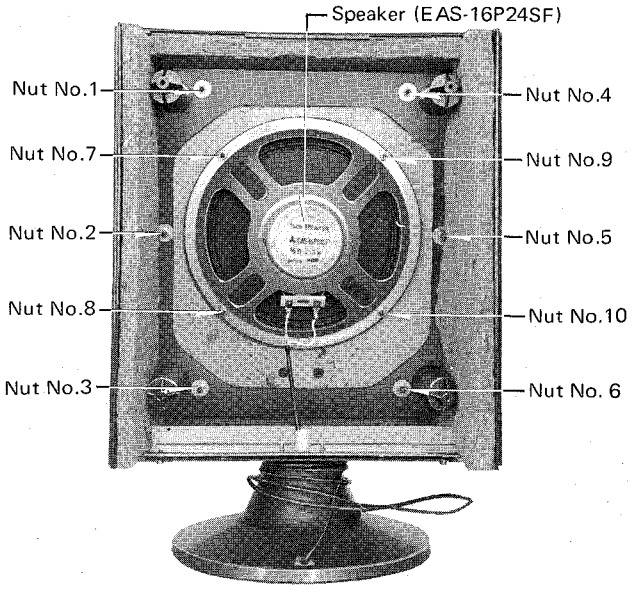
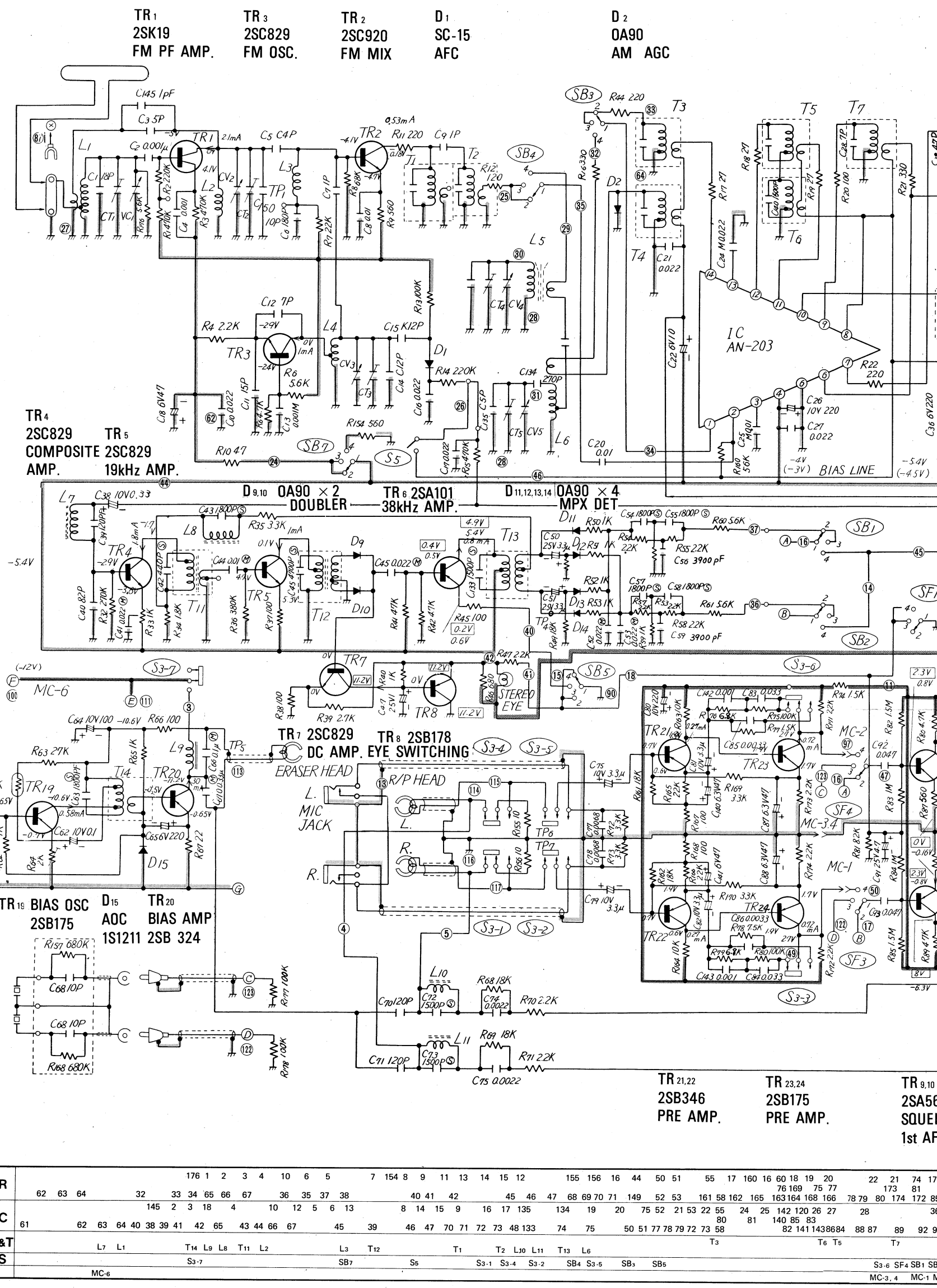


Fig. 7

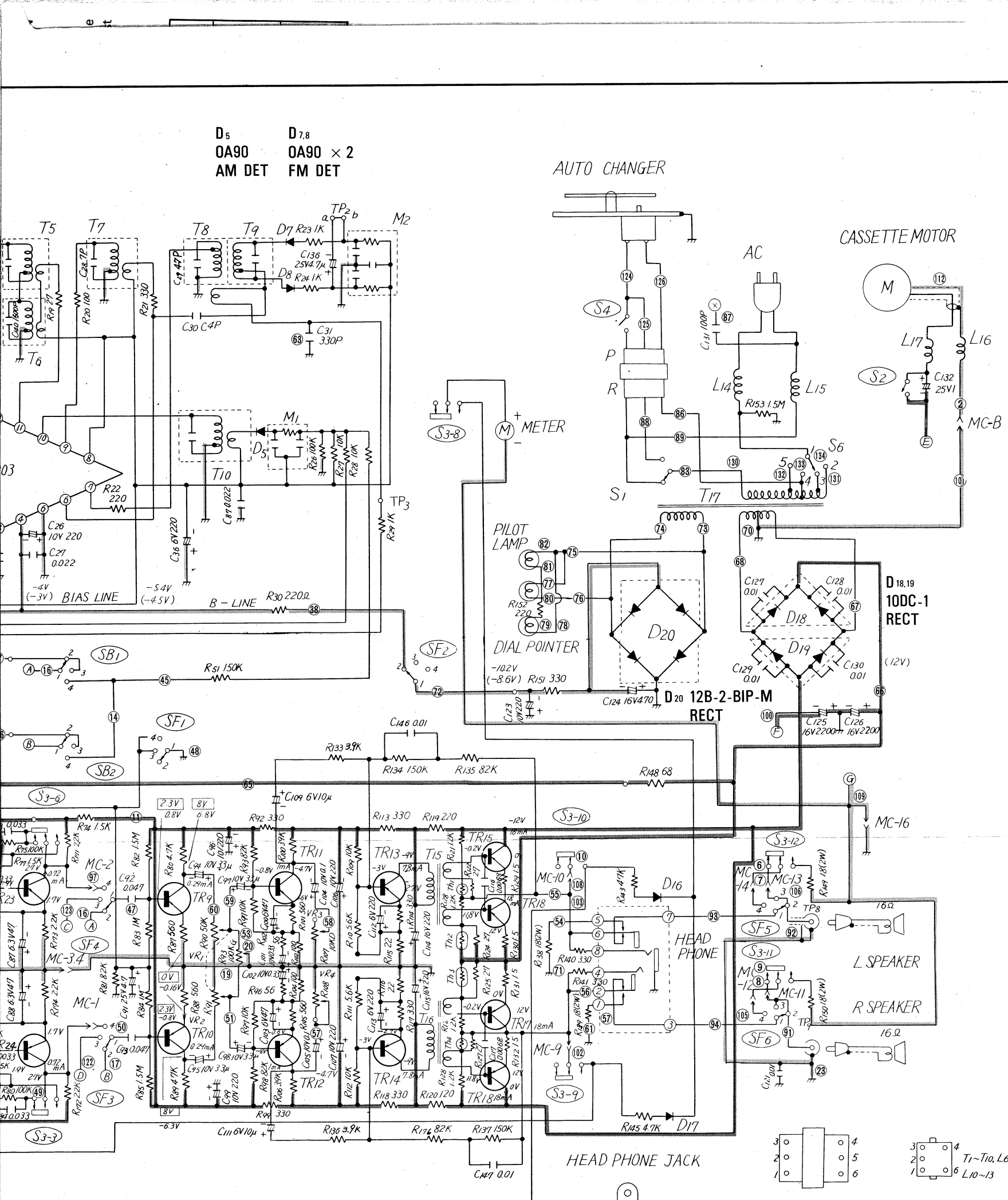
—SCHEMATIC DIAGRAM MODEL SG-990A—



| | | |

D_5 OA90 AM DET

$D_{7,8}$ OA90 × 2 FM DET



TR 23,24 2SB175 PRE AMP.

TR 9,10 2SA564 × 2 SQUELCH & 1st AF AMP.

TR 11,12 2SB173 × 2 2nd AF AMP.

TR 13,14 2SB 6 × 2 DRIVER

TR 15,16,17,18 2SB473 × 4 POWER OUTPUT

| | | |

ALIGNMENT INSTRUCTIONS (RADIO)

FREQUENCY & DISTANCE ON DIAL SCALE

To accurately align to the proper frequencies on the dial scale, refer to Table at right and mark the edge of the dial scale accordingly, using the "Start Point" mark on the dial scale as reference point.

Table

Band	Frequency	Distance from "Start Point"
AM	550 kHz	13.9 mm
	1500 kHz	125.5 mm
FM	90 MHz	37.2 mm
	106 MHz	116.1 mm

AM-IF & RF ALIGNMENT

Output of signal generator should be no higher than necessary to obtain output reading.
Set band selector switch to AM.
Set function selector switch to RADIO.
Set volume control to maximum.
Set tone control to high.
Set balance control to center.
Maintain line voltage at 120 volts.

STEP	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1	Fashion loop of several turns of wire and radiate signal into loop receiver.	455 kHz (400 ~ Mod.)	Point of noninterference. (on/about 600 kHz)	Output meter across Speaker Jack (L) (Imp. 16Ω)	T4 (1st IFT) T6 (2nd IFT) T10 (3rd IFT)	Adjust for maximum output.
2	Fashion loop of several turns ot wire and radiate signal into loop of receiver.	550 kHz (400 ~ Mod.)	550 kHz	Output meter across Speaker Jack (L) (Imp. 16Ω)	L5 (ANT Coil) L6 (OSC Coil)	Adjust for maximum output by sliding coil (L5) along ferrite core.
3	Fashion loop of several turns of wire and radiate signal into loop of receiver.	1500 kHz (400 ~ Mod.)	1550 kHz	Output meter across Speaker Jack (L) (Imp. 16Ω)	CT5 (OSC Trimmer) CT4 (ANT Trimmer)	Adjust for maximum output. Repeat steps (2) and (3).

Notes: 1. Cement antenna bobbin with wax after completing alignment.
2. Make certain that speaker system is connected to the tuner when aligning.

FM-IF & DETECTOR ALIGNMENT WITH OSCILLOSCOPE

EQUIPMENT REQUIRED
Signal generator that provides 10.7 MHz marker.
Sweep generator that provides 10.7 MHz center frequency and 400 kHz sweep width.

OSCILLOSCOPE
Set sweep selector of oscilloscope to "External Sweep".
Set band selector switch to FM.
Set function selector switch to RADIO.
Set volume control to minimum.
Set tone control to high.
Set balance control to center.
Set AFC switch to OFF.
Maintain line voltage at 120 volts.

Apply 60 ~ sweep signal from sweep generator to horizontal input terminals of oscilloscope.

Note: When step 1 aligning, unsolder lead between TP2-a & TP2-b before alignment and resolder it after step 1 alignment.

STEP	SWEEP GENERATOR COUPLING	SIGNAL GENERATOR COUPLING	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1	High side thru. .001 mfd to point TP1 Common to chassis.	High side thru. .001 mfd to Point TP1. Common to chassis.	Point of noninterference. (on/about 98 kHz)	Connect vert. amp. of scope to point TP2. Common to chassis.	T1 (FM 1st IFT) T2 (FM 2nd IFT) T3 (FM 3rd IFT) T5 (FM 4th IFT) T7 (FM 5th IFT) T8 (FM Disc IFT)	Adjust for maximum amplitude and proper linearity between ±100 kHz markers. (Refer to Fig. 9)
2	High side thru. .001 mfd to point TP1. Common to chassis.	High side thru. .001 mfd to point TP1. Common to chassis.	Point of noninterference (on about 98 MHz)	Connect vert. amp. of scope to point TP3. Common to chassis.	T9 (FM Disc IFT)	Adjust T9 so that 10.7 MHz marker is at the center. (Refer to Fig. 10)

Note: 1. Remove line cord antenna from FM external when aligning.
2. Turn the core of T9 (FM Disc IFT) fully counterclockwise before alignment.

MODEL SG-990A

ALIGNMENT INSTRUCTIONS (RADIO)

ALIGNMENT POINTS (RADIO)

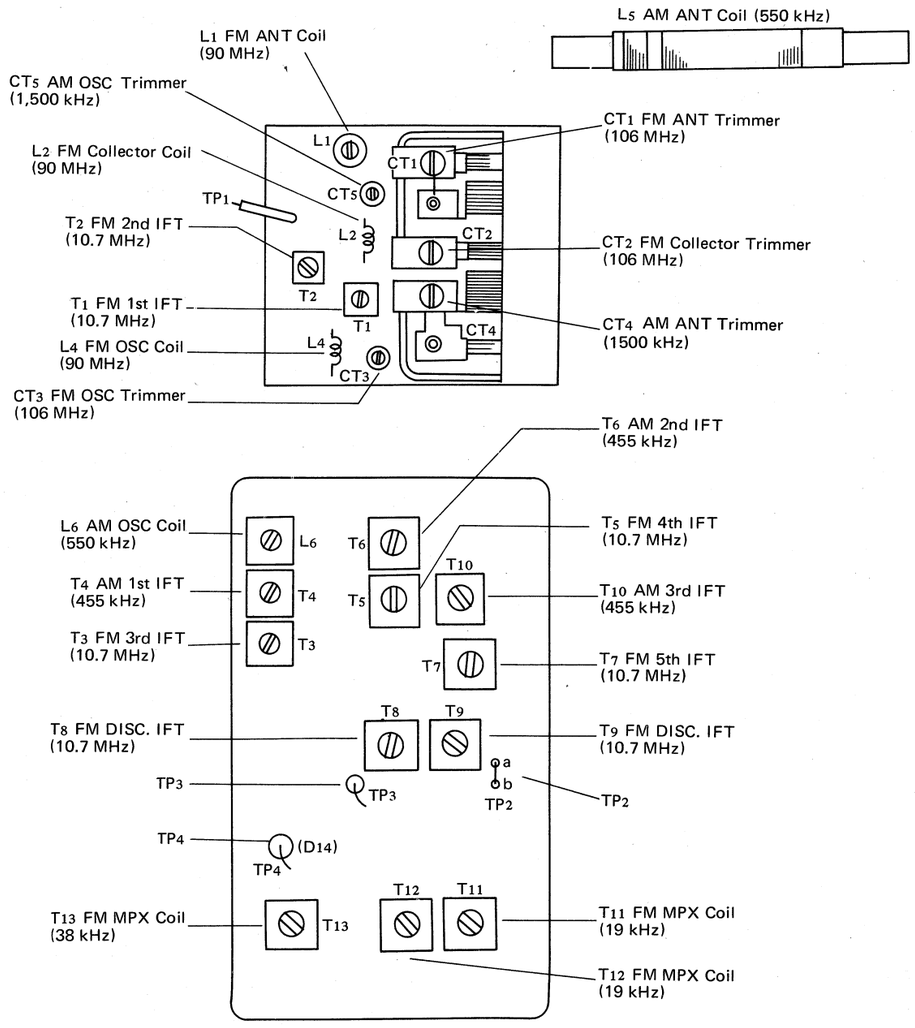

L5 AM ANT Coil (550 kHz)
L1 FM ANT Coil (90 MHz)
CT5 AM OSC Trimmer (1,500 kHz)
CT1 FM ANT Trimmer (106 MHz)
L2 FM Collector Coil (90 MHz)
TP1
T2 FM 2nd IFT (10.7 MHz)
CT2 FM Collector Trimmer (106 MHz)
T1 FM 1st IFT (10.7 MHz)
CT4 AM ANT Trimmer (1500 kHz)
L4 FM OSC Coil (90 MHz)
CT3 FM OSC Trimmer (106 MHz)
T6 AM 2nd IFT (455 kHz)
L6 AM OSC Coil (550 kHz)
T5 FM 4th IFT (10.7 MHz)
T4 AM 1st IFT (455 kHz)
T10 AM 3rd IFT (455 kHz)
T3 FM 3rd IFT (10.7 MHz)
T7 FM 5th IFT (10.7 MHz)
T8 FM DISC. IFT (10.7 MHz)
T9 FM DISC. IFT (10.7 MHz)
TP3
TP2
TP4
(D14)
T13 FM MPX Coil (38 kHz)
T11 FM MPX Coil (19 kHz)
T12 FM MPX Coil (19 kHz)

Fig. 8

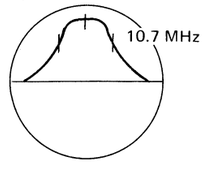


Fig. 9

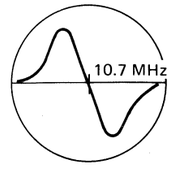


Fig. 10

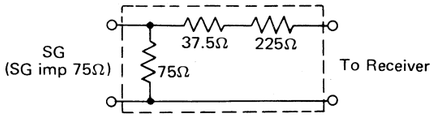


Fig. 11 FM DUMMY ANTENNA

ALIGNMENT INSTRUCTIONS (RADIO)

FM-RF ALIGNMENT

Output of signal generator should be no higher than necessary to obtain an output reading.
Set volume control to maximum.
Set band selector switch to FM.
Set tone control to high.
Maintain line voltage at 120 volts.
Set balance control to center.
Set AFC switch to "OFF".

STEP	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1	Connect to EXT. FM Antenna terminal through FM Dummy antenna. Common to chassis (Refer to Fig. 11)	90 MHz (400 ∾ Mod.)	90 MHz	Output meter across Speaker Jack (L) (Imp. 16Ω)	L_4 (FM OSC Coil) L_1 (FM ANT Coil) L_2 (FM Collector Coil)	Adjust for maximum output.
2	Connect to EXT. FM Antenna terminal through FM Dummy antenna. Common to chassis (Refer to Fig. 11)	106 MHz (400 ∾ Mod.)	106 MHz	Output meter across Speaker Jack (L) (Imp. 16Ω)	CT_3 (FM OSC Trimmer) CT_1 (FM ANT Trimmer) CT_2 (FM Collector Trimmer)	Adjust for maximum output. Repeat steps (1) and (2).

Note: As three output readings will be present, adjustments must be made at center frequency.

FM STEREO ALIGNMENT

19 kHz AMP. ALIGNMENT

Equipment Required

Stereo Modulator . . . . . Connect Stereo Modulator output to EXT. Mod. terminal of signal generator.
Signal Generator . . . . . Modulation Rate of 19 kHz Pilot Signal . . . . . 10%.
Output Level . . . . . 30 dB
Frequency . . . . . Approximately 89.5 MHz
Oscilloscope
Dummy Antenna . . . . . Refer to Fig. 11.

Control Setting & Procedure

Tuner . . . . . Band selector switch to "FM STEREO", Tone control to "HIGH", Balance control to "CENTER", AFC Switch to "OFF", Volume control to audible level of speaker sound, Dial setting to approximately 89.5 MHz.

Notes:
1. When aligning, remove line cord antenna from External FM Antenna terminal.
2. When aligning, set separation control (R_{33}) as shown in Fig. 12.

EQUIPMENT CONNECTION		ADJUST	REMARKS
SIGNAL GENERATOR	OSCILLOSCOPE		
Connect to EXT. FM antenna terminal through Dummy antenna. (Refer to Fig. 11)	Connect vert. Amp. of scope to point TP_4. Common to chassis.	T_{11} (19 kHz Coil) T_{12} (19 kHz Coil) T_{13} (38 kHz Coil)	Adjust T_{11} ~ T_{13} for maximum oscilloscope pattern of 38 kHz.

ALIGNMENT INSTRUCTIONS (RADIO)

SEPARATION ALIGNMENT

Equipment Required

Stereo Modulator . . . . . Connect Stereo Modulator output to EXT. Mod. terminal of signal generator.
Signal Generator . . . . . Modulation Rate of 19 kHz Pilot Signal. 10%
Modulation Rate of Right and Left Signal 27%
Output Level . . . . . 60 dB
Oscilloscope
Dummy Antenna . . . . . Refer to Fig. 11.
VTVM

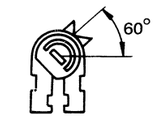


Fig. 12 R_{33} SEPARATION CONTROL

Control Setting & Procedure

Tuner . . . . . Band selector switch to "FM STEREO", Tone control to "CENTER", Volume control to audible level of speaker sound, AFC switch to "OFF", Dial setting to approximately 89.5 MHz. Adjust balance control so that output level from both units becomes equal.

EQUIPMENT COUPLING			ADJUSTMENT	REMARKS
SIGNAL GENERATOR	VTVM	OSCILLOSCOPE		
Connect to EXT. FM antenna terminal through Dummy antenna.	Connect across speaker jack. (Left Side) (Imp. 16Ω)	Connect to Terminals of VTVM.	T_{13} (MPX Coil) T_{11} (MPX Coil)	Adjust T_{12} & T_{10} for minimum indication on VTVM from the left side output when the right side of stereo modulator is modulated.
Connect to EXT. FM antenna terminal through Dummy antenna.	Connect across speaker jack. (Left Side) (Imp. 16Ω)	Connect to terminals of VTVM.	R_{33} (Separation Control)	Adjust R_{33} for minimum indication on VTVM from the left side output when the right side of stereo modulator is modulated.

Note: When separation aligning, disconnect lead between TP_4 and Oscilloscope (A) before alignment.

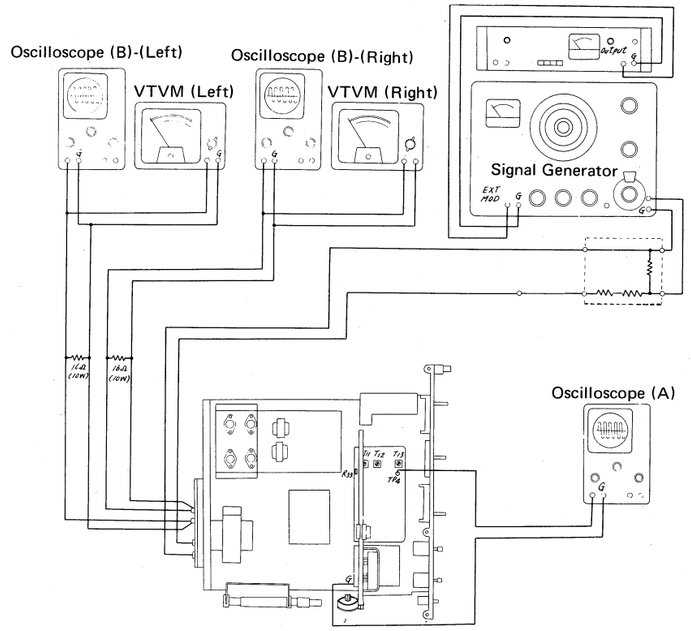


Fig. 13 RECOMMENDED EQUIPMENT CONNECTION FOR SEPARATION ALIGNMENT

PARTS IDENTIFICATION

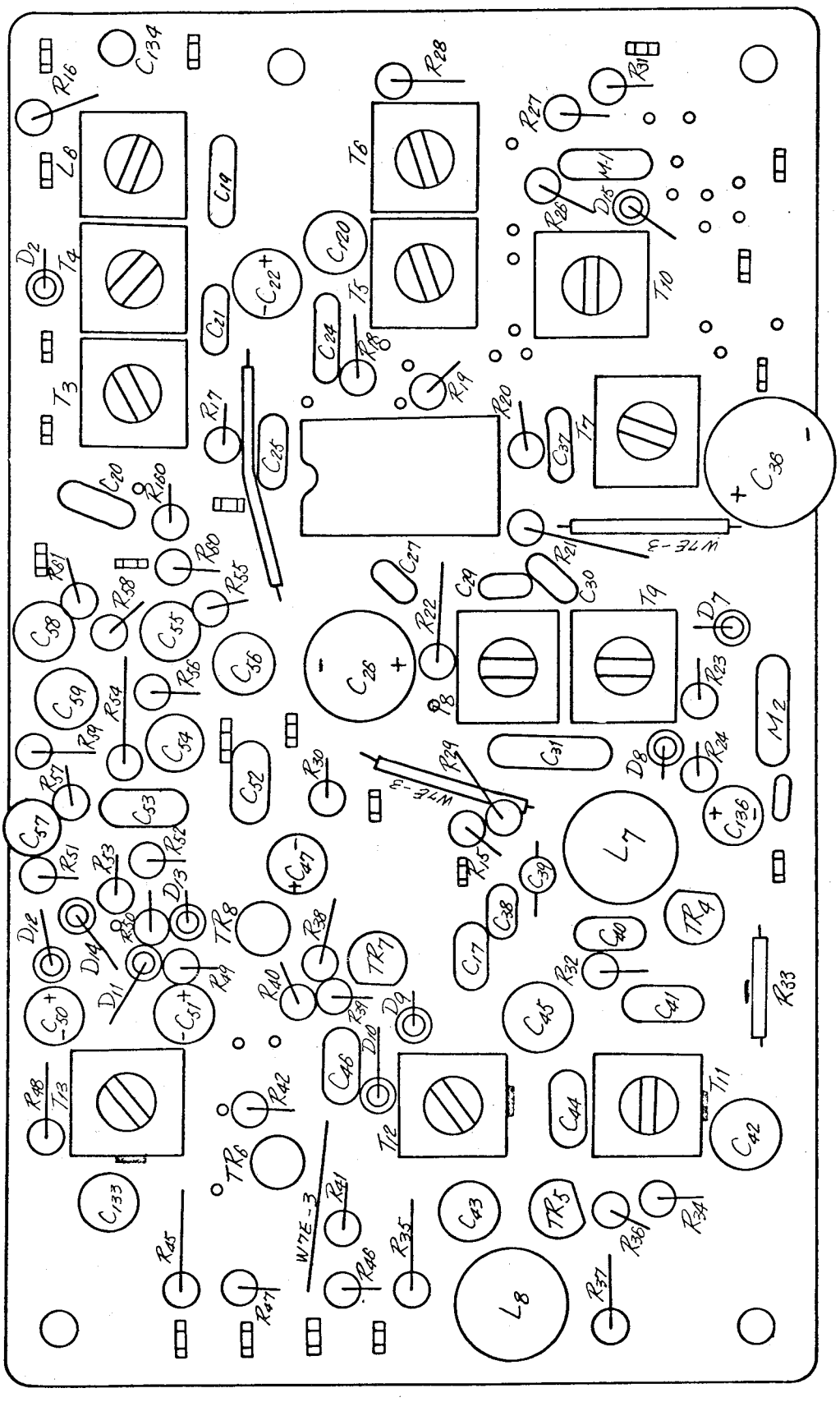


Fig. 14 IF (FM & AM) AND MULTIPLEX SECTION

PARTS IDENTIFICATION

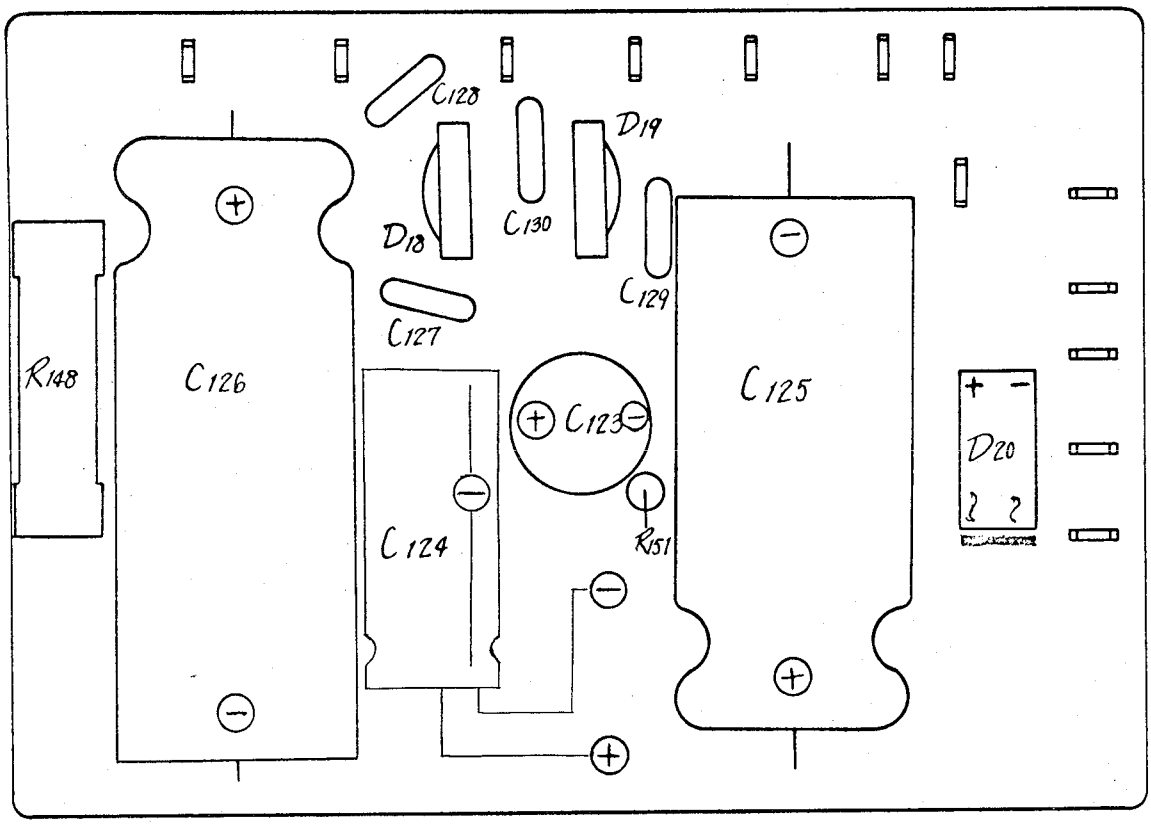


Fig. 15 POWER SUPPLY SECTION

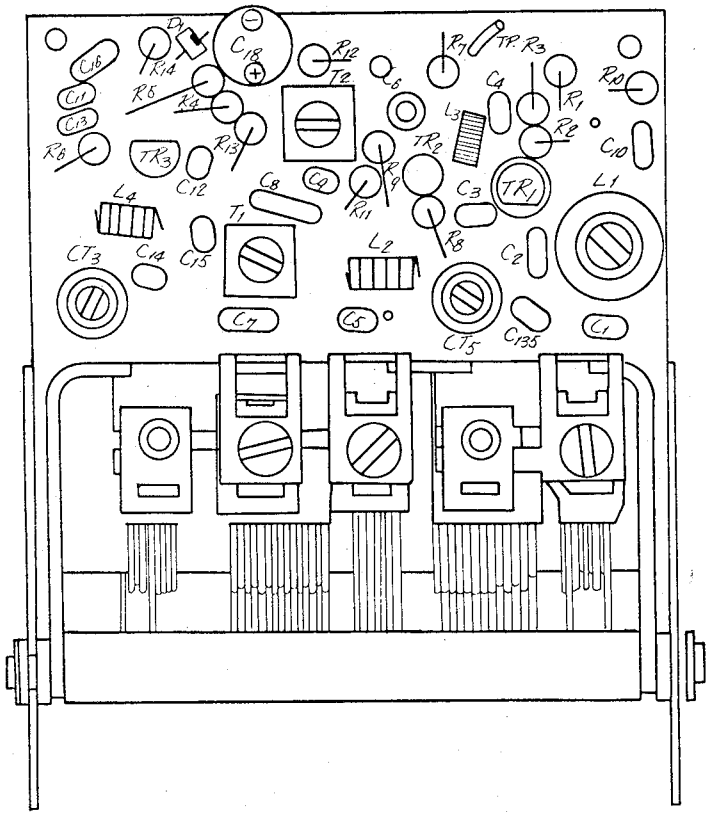


Fig. 16 RF SECTION (FM & AM)

PARTS IDENTIFICATION

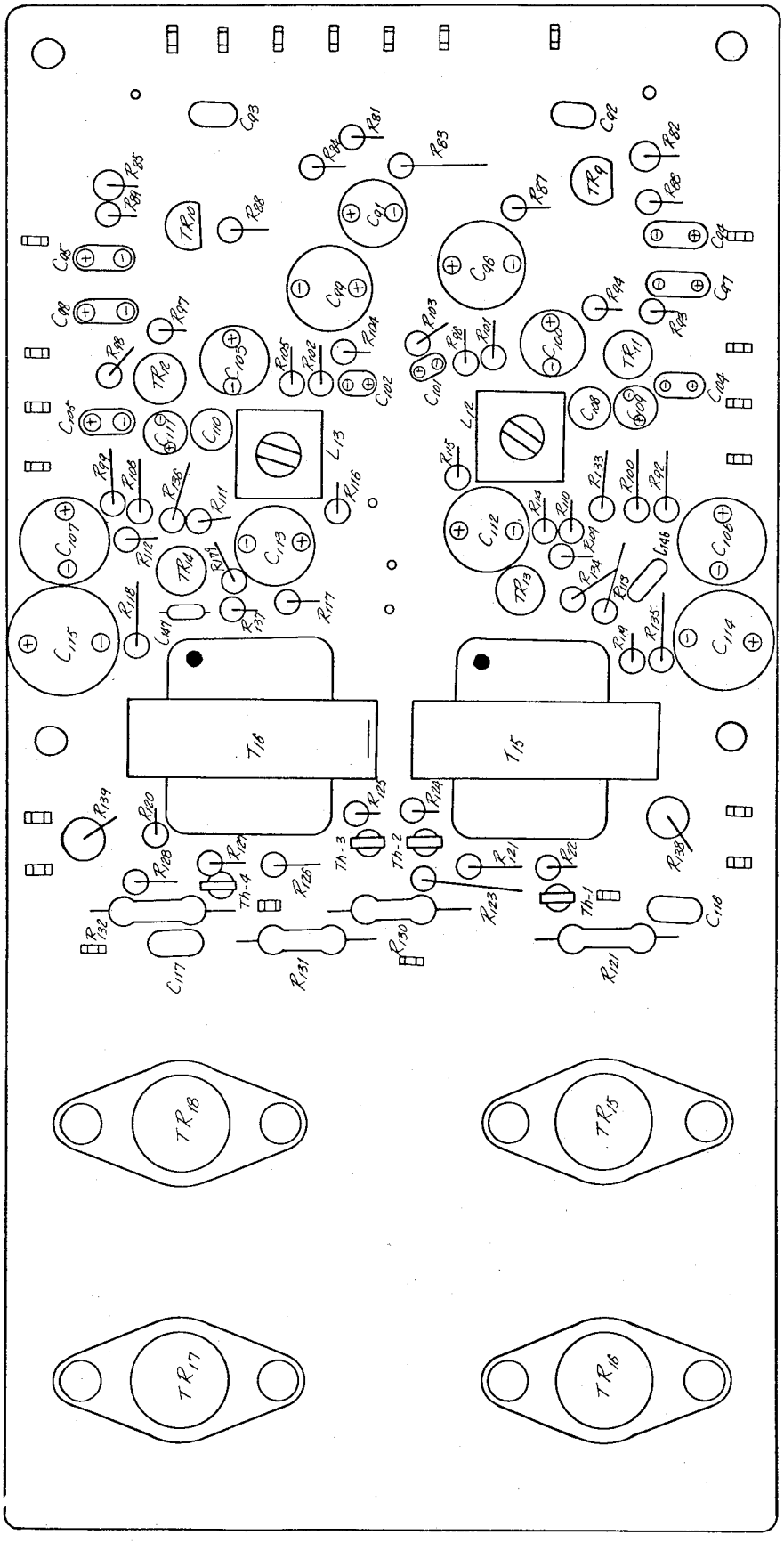


Fig. 17 AUDIO SECTION

PARTS IDENTIFICATION

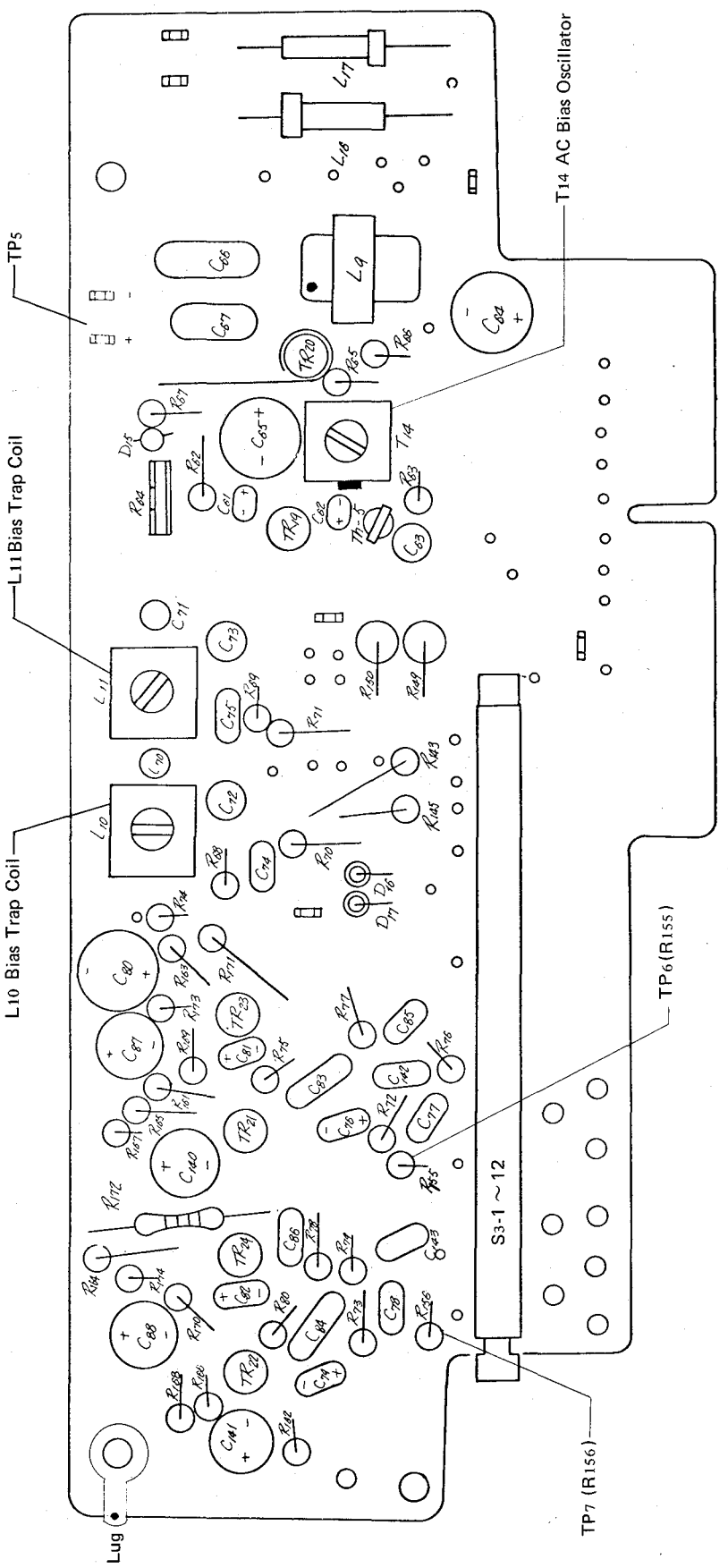


Fig. 18 CASSETTE TAPE SECTION

CIRCUIT BOARD WIRING VIEW MODEL SG-990A

TR23, 24

C	2.7V
B	1.9V
E	1.7V
Ic	0.72mA

TR21, 22

C	1.9V
B	0.7V
E	0.6V
Ic	0.27mA

TR19

C	−10.6V
B	−0.65V
E	−0.7V
Ic	0.58mA

TR20

C	−11.2V
B	−0.5V
E	−0.65V
Ic	30mA

TR15, 17

C	−12V
B	−0.2V
E	0
Ic	18mA

TR16, 18

C	0
B	11.8V
E	12V
Ic	18mA

TR9, 10

	FM	STEREO
C	−6.3V	8V
B	−0.7V	2.3V
E	−0.16V	0
Ic	0.29mA	0

TR5

C	0.1V
B	4.7V
E	5.3V
Ic	1mA

TR6

	FM	STEREO
C	5.4V	4.9V
B	0.5V	0.4V
E	0.6V	0.2V
Ic		0.8mA

TR7

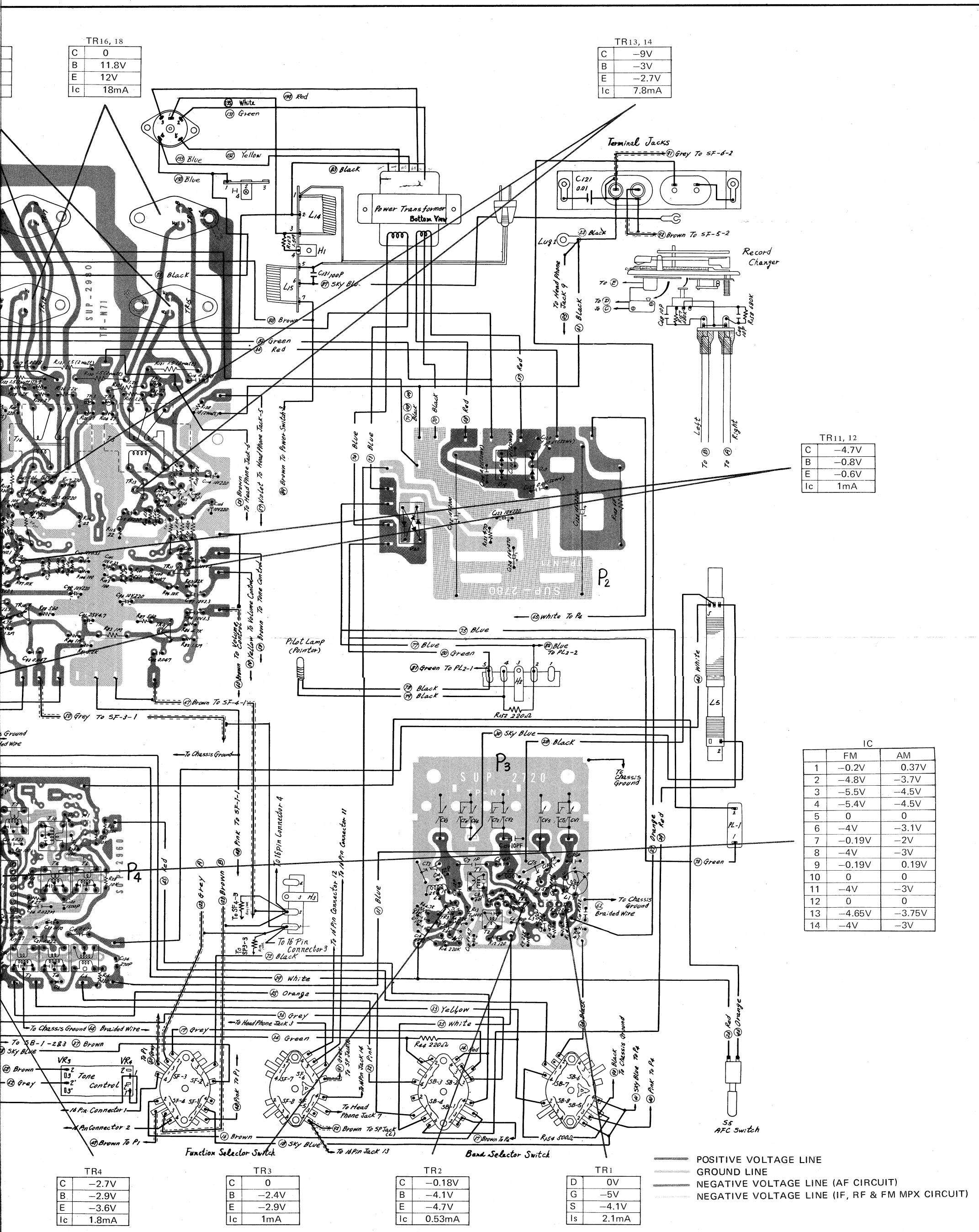
	STEREO
C	11.2V
B	0
E	0
Ic	0

TR8

	STEREO
C	11.2V
B	11.2V
E	0
Ic	0

TR4

C	−2.7V
B	−2.9V
E	−3.6V
Ic	1.8mA


TR16, 18
C 0
B 11.8V
E 12V
Ic 18mA
TR13, 14
C −9V
B −3V
E −2.7V
Ic 7.8mA
TR11, 12
C −4.7V
B −0.8V
E −0.6V
Ic 1mA
IC
1 FM −0.2V AM 0.37V
2 FM −4.8V AM −3.7V
3 FM −5.5V AM −4.5V
4 FM −5.4V AM −4.5V
5 FM 0 AM 0
6 FM −4V AM −3.1V
7 FM −0.19V AM −2V
8 FM −4V AM −3V
9 FM −0.19V AM 0.19V
10 FM 0 AM 0
11 FM −4V AM −3V
12 FM 0 AM 0
13 FM −4.65V AM −3.75V
14 FM −4V AM −3V
TR4
C −2.7V
B −2.9V
E −3.6V
Ic 1.8mA
TR3
C 0
B −2.4V
E −2.9V
Ic 1mA
TR2
C −0.18V
B −4.1V
E −4.7V
Ic 0.53mA
TR1
D 0V
G −5V
S −4.1V
Is 2.1mA
Terminal Jacks
Power Transformer Bottom View
Record Changer
Pilot Lamp (Pointer)
Function Selector Switch
Band Selector Switch
55 AFC Switch
To Chassis Ground
To Volume Control
To Tone Control
To Head Phone Jack 9
To Power Switch 2
To Head Phone Jack 5
To Head Phone Jack 3
To Head Phone Jack 7
To 16 Pin Connector 1
To 16 Pin Connector 2
To 16 Pin Connector 3
To 16 Pin Connector 4
To 16 Pin Connector 11
To 16 Pin Connector 12
To 16 Pin Jack 13
To SP Jack (L)
To SP Jack (R)
To SP3-3
To SF-4-3
To Braided Wire
Braided Wire
Grey To SF-3-1
Brown To SF-4-1
Brown To P1
Pink To SF-1-1
Pink To P1
Green To PL2-1
Blue To PL2-2
White To P4
Black To Chassis Ground
Sky Blue To P4
Pink To P4
Brown To P2
Brown To SF-5-2
Grey To SF-6-2
Brown To Tone Control
Violet To Head Phone Jack 5
Yellow To Volume Control
Brown To Yakyng Control
Sky Blue To 18 Pin Jack 13
Brown To SP Jack (L)
Grey To SP Jack (R)
P1
P2
P3
P4
SUP-2980
SUP-2720
TP-N71
L5
PL-1
Red
Orange
Green
Blue
White
Yellow
Grey
Brown
Black
Sky Blue
Pink
Braided Wire
POSITIVE VOLTAGE LINE
GROUND LINE
NEGATIVE VOLTAGE LINE (AF CIRCUIT)
NEGATIVE VOLTAGE LINE (IF, RF & FM MPX CIRCUIT)

ALIGNMENT INSTRUCTIONS (TAPE RECORDER)

CONTROL SETTING & PROCEDURE

- Set function selector switch to TAPE.
- Depress "REC" buttons simultaneously.
- Set power source switch to ON.
- Maintain line voltage at 120 volts.

Refer to Figs. 18 & 19.

STEP	CIRCUITS	VTVM CONNECTION	VOLUME CONTROL	ADJUSTMENT	REMARKS
1	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP5 (+) and negative side to TP5 (–). (Refer to VTVM-1 in Fig. 19)	MIN	T14 (AC Bias OSC) R64 (Voltage Control)	Adjust T14 for Maximum indication of VTVM-1. Adjust R64 for 13 V reading on VTVM-1.
2	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP6 and negative side to lug. (Refer to VTVM-2 in Fig. 19)	MIN	L11 (AC Bias Trap Coil)	Adjust L11 for 5 mV reading on VTVM-2.
3	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP7 and negative side to lug. (Refer to VTVM-3 in Fig. 19)	MIN	L10 (AC Bias Trap Coil)	Adjust L10 for 5 mV reading on VTVM-3. Repeat steps (2) and (3). When adjusting steps (1) and (2), disconnect VTVM-1.
4	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP7 and negative side to lug. (Refer to VTVM-3 in Fig. 19)	MIN	T14	Adjust T14 for maximum indications on VTVM-2 and 3.
5	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP5 (+) and negative side to TP5 (–). (Refer to VTVM-1 in Fig. 19)	MIN	R64 (Voltage Control)	Adjust T14 for 13V reading on VTVM-1. Repeat steps (2) and (3).

Notes: 1. Cement part of semi-fixed volume control (R64), as shown in Fig. 20.
2. Do not touch R/P head Erase head when adjusting.

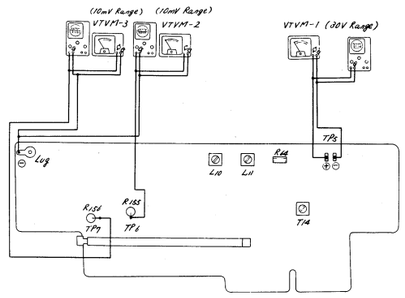


Fig. 19 RECOMMENDED EQUIPMENT CONNECTIONS

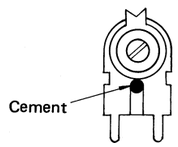


Fig. 20

RECORD/PLAYBACK HEAD AZIMUTH ADJUSTMENT

Playback a Standard Alignment Tape and turn head adjustment screw for maximum loudness.

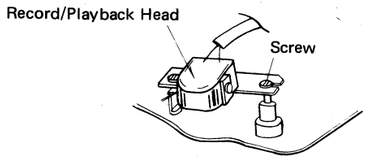


Fig. 21

MECHANICAL ADJUSTMENT-TAPE RECORDER

PINCH ROLLER ADJUSTMENT (Refer to Fig. 22)

1. Switch set to PLAY.
2. Pull pinch roller in the direction of arrows with spring gauge, as shown in Fig. 22.
3. Pull the pinch roller away from the capstan, start motor, permit the pinch roller to make contact with the capstan and measure tension at time of contact.
4. The standard pressure of pinch roller should be 350 ± 50g.
5. If pressure is beyond limits, change the fixed position of pinch roller spring and repeat the above measurement or replace pinch roller assembly.

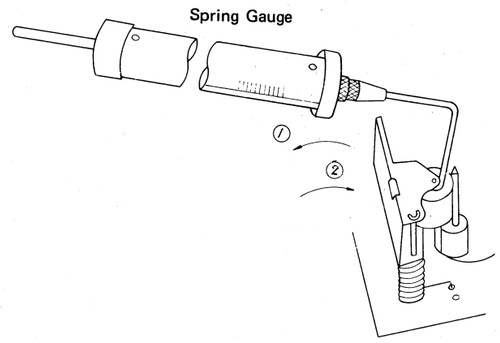


Fig. 22

TAKE-UP TORQUE ADJUSTMENT

Take-up Torque Measurement with Torque Meter (Refer to Fig. 23)

Equipment Required:

- Torque Meter (having a range of 20 ~ 100g/cm)
- Attachment (Take reel out of cassette tape, makes 2 holes through its frame, and attach it to the torque meter with wire.)

1 Switch set to PLAY and put attachment with the torque meter onto take-up reel.
2. The standard take-up tension of the take-up reel should be 55 ± 20 g/cm.

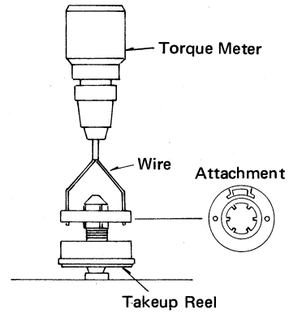


Fig. 23

Take-up Torque Measurement with Tension Gauge (Refer to Fig. 24)

Equipment Required:

- Tension Gauge
- Attachment

1. Switch set to PLAY.
2. Put attachment which is connected to tension gauge by cord (about 30 cm) onto the take-up reel.
3. To read the number of the tension gauge, move the gauge in direction of arrow without slacking the cord.
4. The standard take-up tension of the take-up reel should be 55 ± 20g/cm.

If the take-up tension is beyond these limits,
a) remove oil and dirt from flywheel belt (38) and/or
b) remove oil and dirt from the rubber part of the take-up reel and/or
c) remove rust from pinch roller or replace with new one and/or
d) replace clutch felt (54) or take-up arm (51).

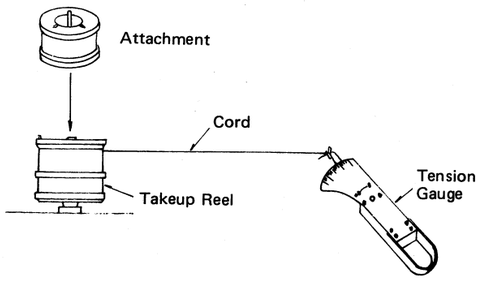


Fig. 24

TAPE TRANSPORT OPERATIONS

PLAYBACK (Refer to Fig. 25)

When play button is depressed, play button lever moves brake operating lever (43).
The brake arm (22) which stops both reels is then released.
At this time, brake operating lever causes one leaf of the motor ON-OFF switch to make contact with the other, starting the motor.
Set is then in the playback mode. Motor drives fly-wheel (36) by a belt (38).
When take-up arm (51) moves, take-up idler (55) makes contact with take-up reel.
The take-up reel (26) begins to take-up tape by means of rotation of the take-up arm (51).
At the same time, pinch roller (11) makes contact with the capstan in order to start the tape motion.
The playback/record and erase heads (21) make contact with the surface of the tape.

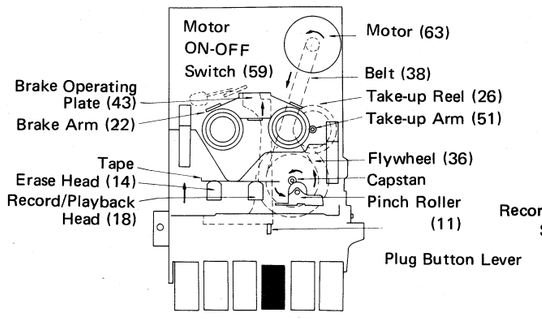


Fig. 25

RECORD (Refer to Fig. 26)

When record and play button are depressed at the same time, play button lever moves brake operating lever.
At this time, brake operating causes one leaf of the motor ON-OFF switch to make contact with the other, starting the motor. REC button lever activates the playback-REC Selector Switch. Operation of the unit is the same as for playback.

Note:

If the knock out plug of the tape cassette is removed, record button will not function. In order to record cover hole with adhesive tape.
This set uses a 4-track stereo recording system.
If source is monaural, the same signals recorded on both channels.
"For best results it is recommended to use only Panasonic C90 or C60 cassette".

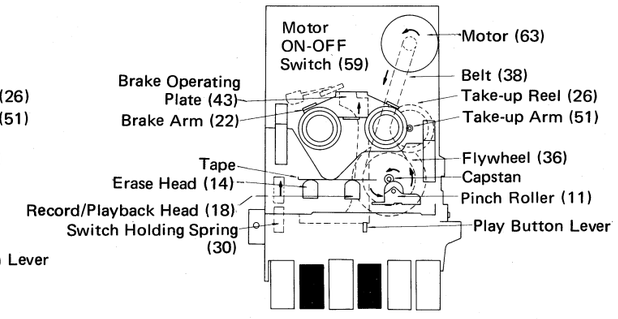


Fig. 26

FAST FORWARD (Refer to Fig. 27)

When FF button is depressed, FF button lever moves FF operating plate (46).
Then FF idler arm (44) makes contact with the flywheel.
The rotation of the flywheel is transmitted to FF idler through contact with the flywheel and take-up reel.

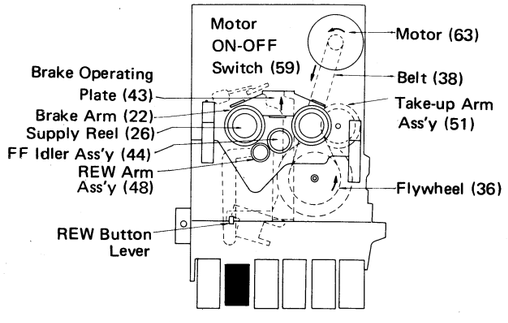


Fig. 27

REWIND (Refer to Fig. 28)

When REW button is depressed, REW arm (48) is moved forward (in the direction of arrow) by spring (49). REW idler (48) contacts with FF idler and the supply reel (26).
At the same time, FF idler contacts with flywheel and REW idler.
The rotation of the flywheel is transmitted to REW idler and FF idler.

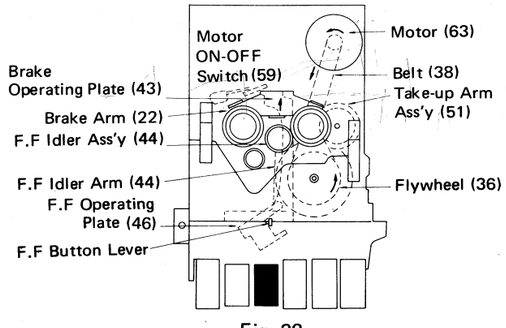


Fig. 28

PARTS IDENTIFICATION-TAPE DECK

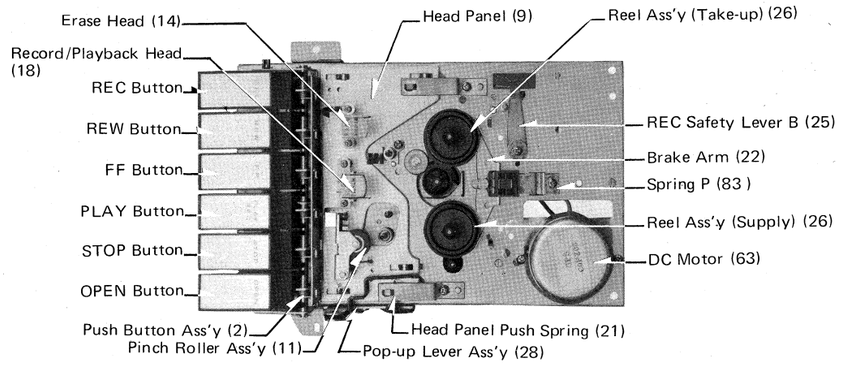


Fig. 29

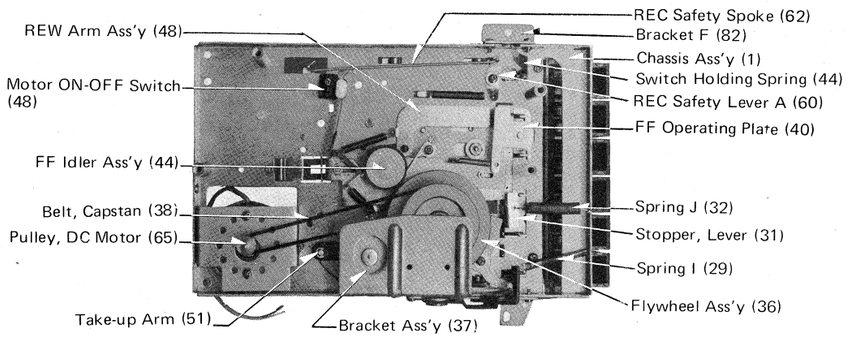


Fig. 30

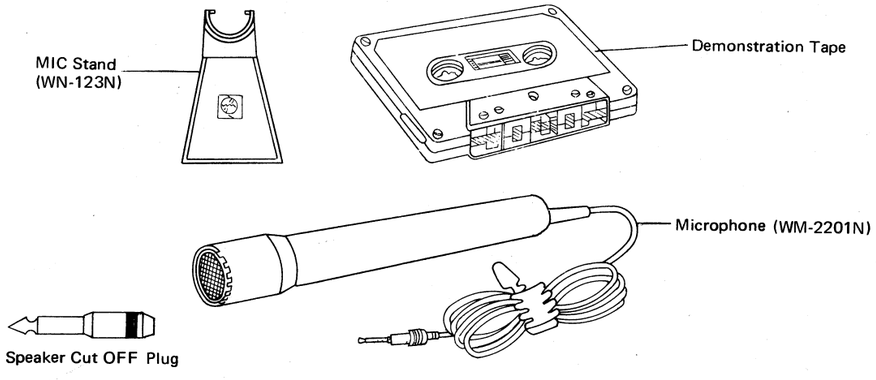


Fig. 31

DIAL CORD STRINGING GUIDE

To Reassemble Tuning Gears

1. Put tuning gears together.
2. Connect the gears with the spring as shown in Fig. 32.
3. Set tuning capacitor to fully closed position.
   Mount the tuning gear on the tuning capacitor with mounting screw and washer.
4. Rotate the two tuning gears in the opposite direction.
   Pull gear spring about 7.5 mm, as shown in Fig. 32.
   Mount dial drum with the mounting screw, as shown in Fig. 33.

Note:
After dial drum is fixed, make sure that if there is no back lash of dial drum.

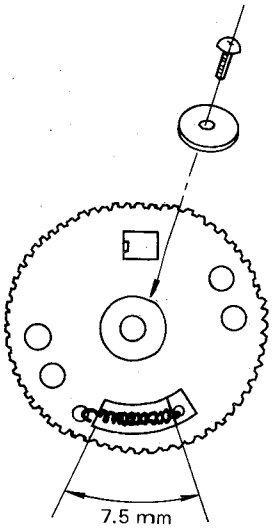


Fig. 32

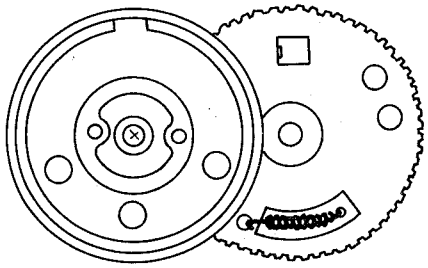


Fig. 33

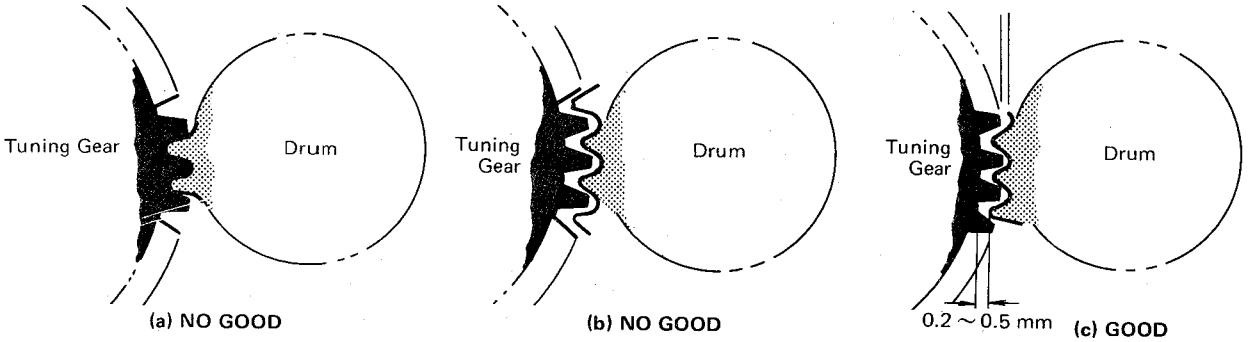
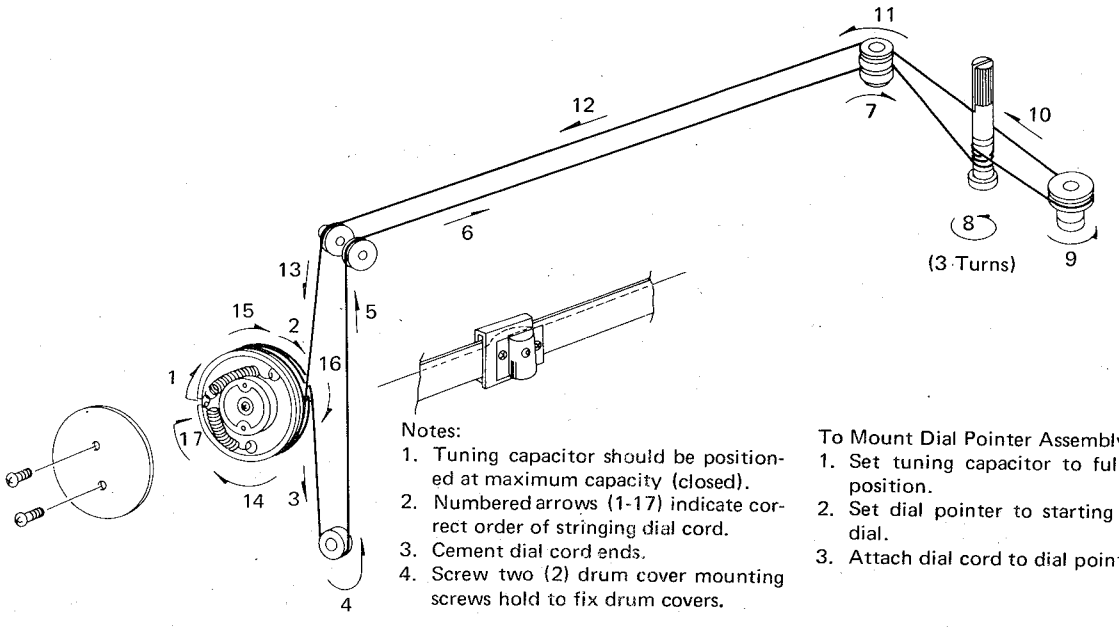


Fig. 34



Notes:
1. Tuning capacitor should be positioned at maximum capacity (closed).
2. Numbered arrows (1-17) indicate correct order of stringing dial cord.
3. Cement dial cord ends.
4. Screw two (2) drum cover mounting screws hold to fix drum covers.

To Mount Dial Pointer Assembly
1. Set tuning capacitor to fully closed position.
2. Set dial pointer to starting point of dial.
3. Attach dial cord to dial pointer.

Fig. 35

TAPE RECORDER CIRCUITS

1. Recording Circuits (Refer to Figs. 36 & 37)

Signals for recording are selected by switches SB & SF and applied to AF Amplifiers (SF . . . MIC→Equalizer Amp.). The recording signals, amplified by AF Amplifiers, passes capacitors ($C_{70} \sim 73$), resistors ($R_{68} \sim 71$) and L_{10} & L_{11}, to reach recording head, and is finally recorded on the magnetic tape. R_{70} & 71 are used to keep the head current constant and to compensate high frequency response.

As Fig. 36 shows, impedance of the head increases in proportion to the frequency. In order to keep the head current constant, output impedance R should either be greatly increased or, if it is low, the signal voltage applied to the head should be increased in proportion to the frequency. R_{68} & 69 are used for this purpose. $L_{10, 11}$ & $C_{72, 73}$ are resonated to recording (or erasing) bias frequency. L_{10} & 11, & $C_{72, 73}$ are used to adjust recording bias current.

where : Z=Impedance of Head
V=Record Signal Voltage
i =Record Current

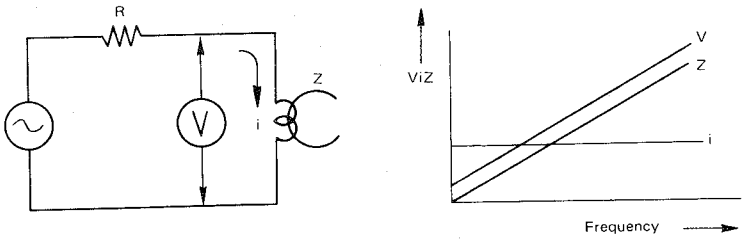


Fig. 36

2. Recording Indicator Circuit (Refer to Fig. 37)

When PLAY and REC button are depressed, a portion of the record signals is applied from outputs of AF Amplifiers to R_{143} and R_{145}. Then these signals are rectified and reach the level meter.

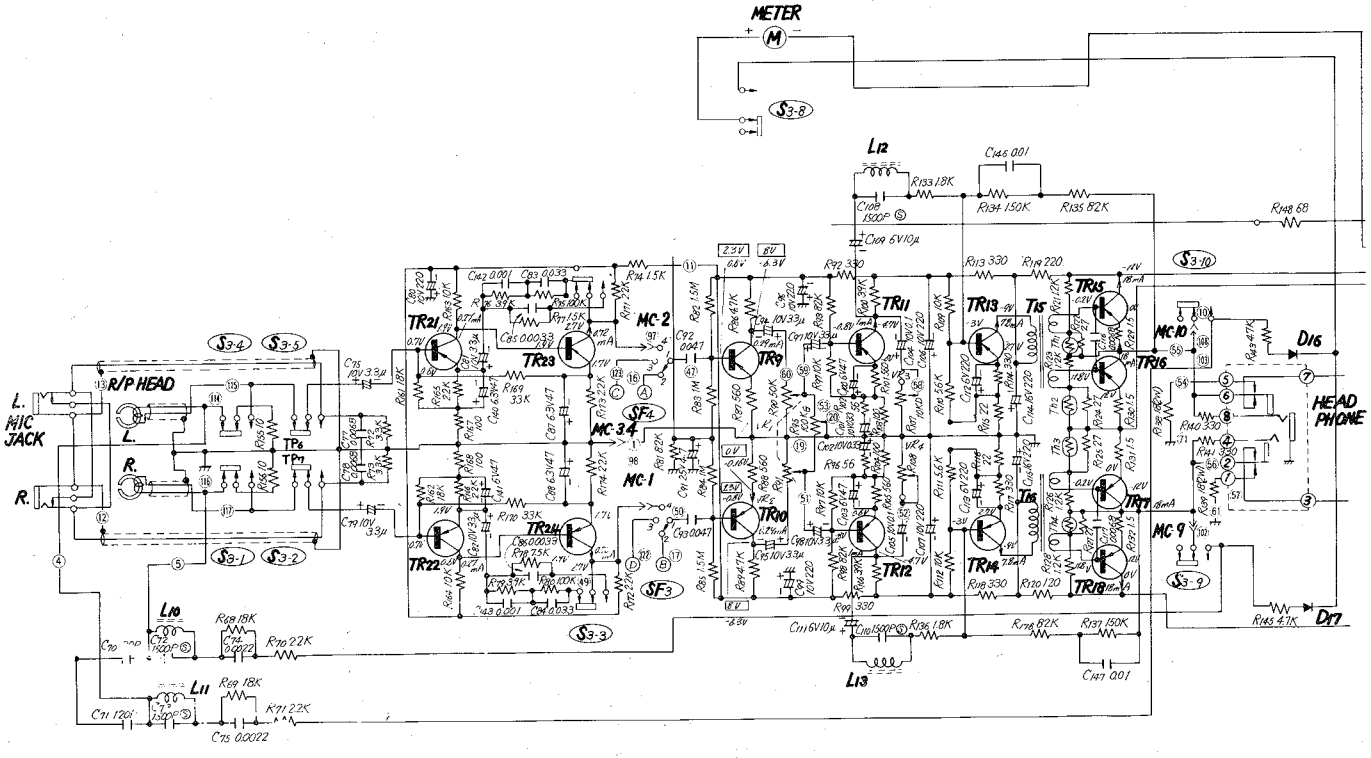


Fig. 37

TAPE RECORDER CIRCUITS

3. AC Bias Oscillator and Erase Circuits (Refer to Fig. 38)

By employing an AC erase system, erasing and recording can be accomplished with little distortion or noise. The AC erase current required for the erase head is approximately 100 mA (at both ends of head). If the waveform of the erasing current is distorted, hamonics of the oscillator frequency (50 ~ 55 kHz) are radiated by the erasing head winding and picked up by the AM ferrite core antenna. These harmonics cause "beat" interference while recording AM broadcasting signals. The tank circuit, which is tuned to (50 ~ 55 kHz), is the collector load TR_{20}, and consists of C_{66}, C_{67}, and inductance of erase head, and TR_{20} applies sufficient erasing current to the erase head with little distortion. An increase of distortion is caused by changes of temperature and line voltage. To prevent deterioration of frequency characteristics, record level and erase, a thermistor (TH MT-10K) is employed in the Bias Oscillator stage TR_{19} and a diode (D_{15} 1S1121) in the Bias Power Amplifier Stage TR_{20}.

In addition, a portion of the erasing bias current is applied to the record head through capacitors C_{70} and C_{71}.

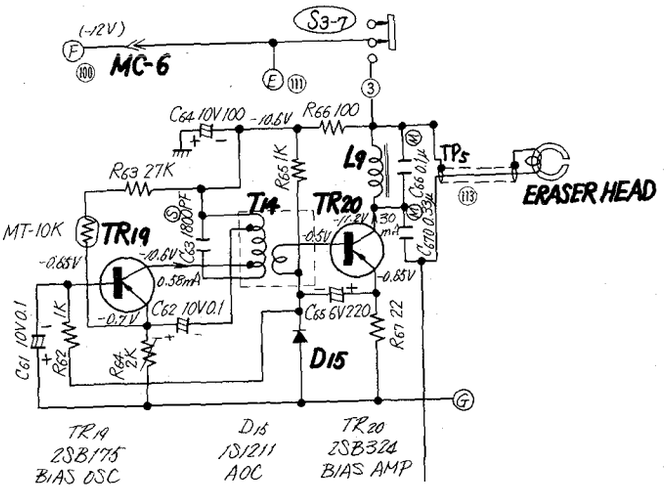


Fig. 38

4. Playback Circuits

The audio signal picked up by the playback head is applied to the audio Pre-Amplifiers TR_{21} ~ $_{24}$. Frequency characteristics of audio signal (which was picked up by the playback head) are boosted in the high frequency range and therefore, the audio signal needs to be equalized by Equalizer Amplifiers TR_{21}, TR_{22}, TR_{23}, and TR_{24} to obtain a flat frequency response.

In the Equalizer Amplifier stages, NFB (negative feedback) circuits, consisting of C_{83}, C_{84}, C_{42}, C_{143}, R_{75}, R_{76}, R_{79}, R_{80} are employed to obtain the required equalizing characteristics. The audio signal (with flat frequency response) enters the AF Amplifiers from the Equalizer Amplifiers.

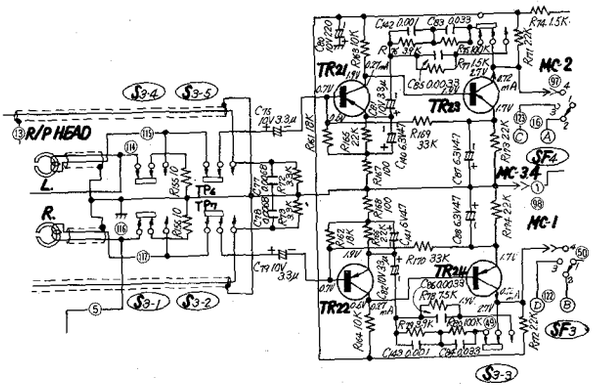
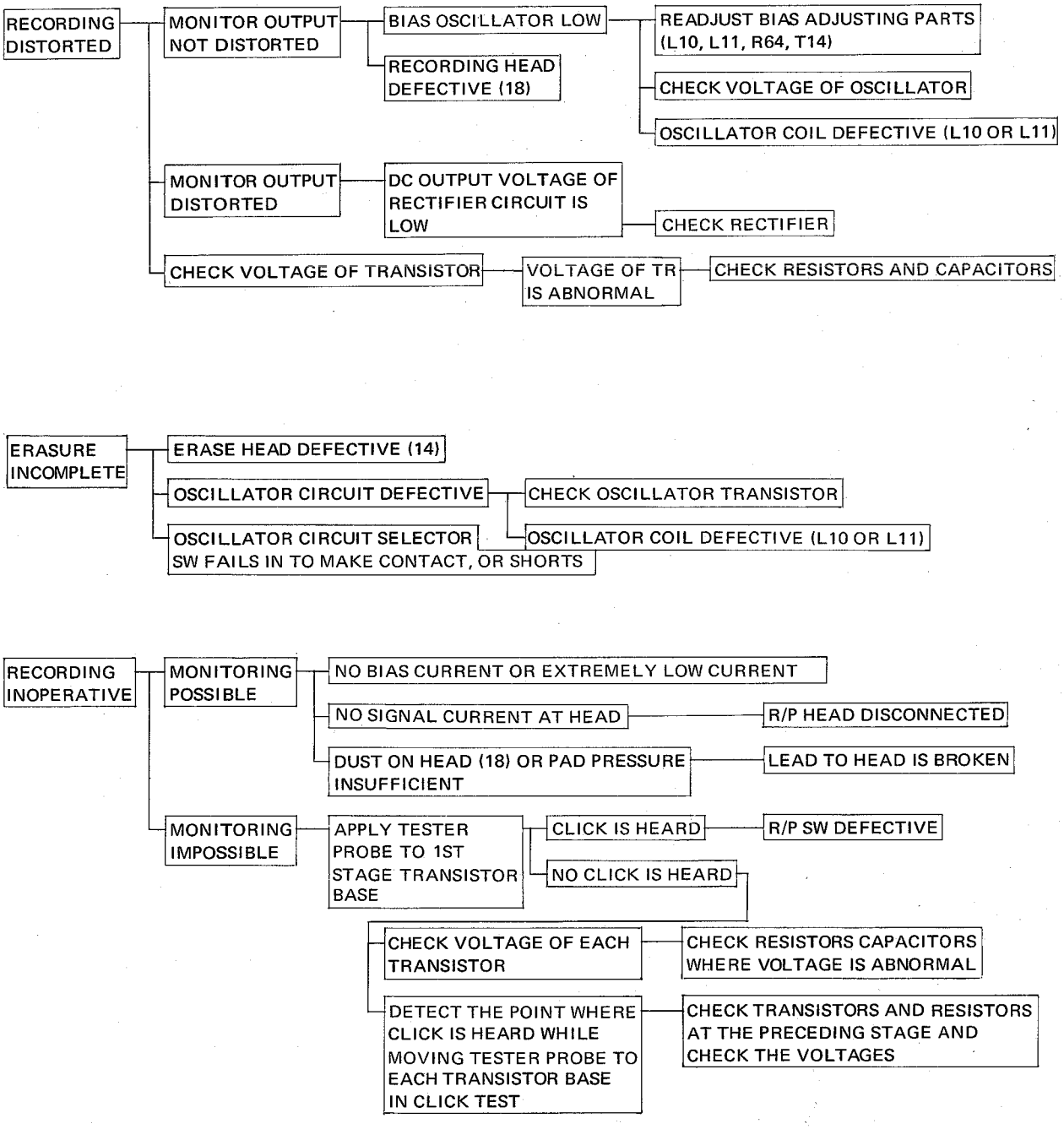


Fig. 39

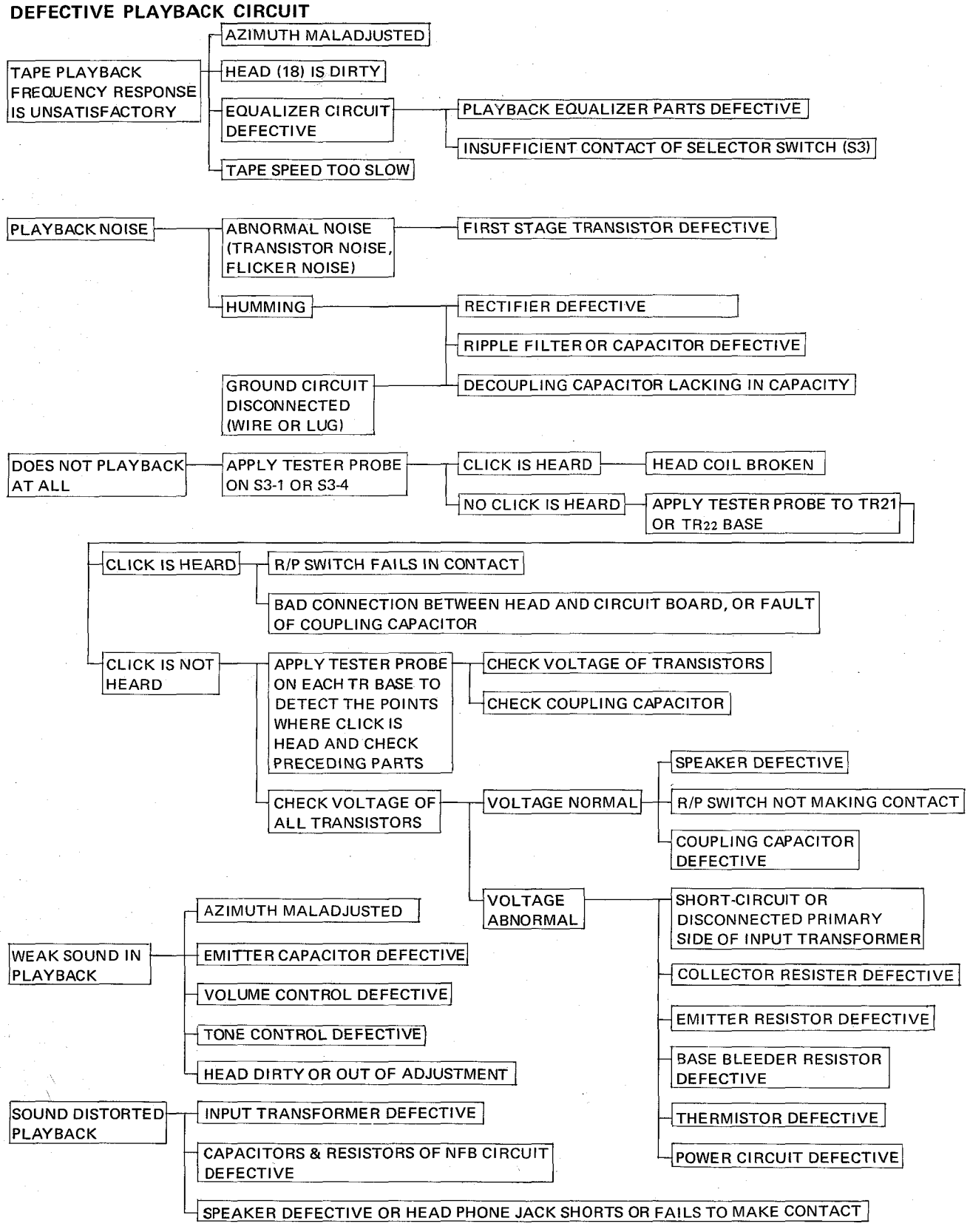
TROUBLE SHOOTING GUIDE 1

DEFECTIVE RECORDING CIRCUIT


RECORDING DISTORTED
MONITOR OUTPUT NOT DISTORTED
BIAS OSCILLATOR LOW
READJUST BIAS ADJUSTING PARTS (L10, L11, R64, T14)
CHECK VOLTAGE OF OSCILLATOR
OSCILLATOR COIL DEFECTIVE (L10 OR L11)
RECORDING HEAD DEFECTIVE (18)
MONITOR OUTPUT DISTORTED
DC OUTPUT VOLTAGE OF RECTIFIER CIRCUIT IS LOW
CHECK RECTIFIER
CHECK VOLTAGE OF TRANSISTOR
VOLTAGE OF TR IS ABNORMAL
CHECK RESISTORS AND CAPACITORS
ERASURE INCOMPLETE
ERASE HEAD DEFECTIVE (14)
OSCILLATOR CIRCUIT DEFECTIVE
CHECK OSCILLATOR TRANSISTOR
OSCILLATOR CIRCUIT SELECTOR SW FAILS IN TO MAKE CONTACT, OR SHORTS
OSCILLATOR COIL DEFECTIVE (L10 OR L11)
RECORDING INOPERATIVE
MONITORING POSSIBLE
NO BIAS CURRENT OR EXTREMELY LOW CURRENT
NO SIGNAL CURRENT AT HEAD
R/P HEAD DISCONNECTED
DUST ON HEAD (18) OR PAD PRESSURE INSUFFICIENT
LEAD TO HEAD IS BROKEN
MONITORING IMPOSSIBLE
APPLY TESTER PROBE TO 1ST STAGE TRANSISTOR BASE
CLICK IS HEARD
R/P SW DEFECTIVE
NO CLICK IS HEARD
CHECK VOLTAGE OF EACH TRANSISTOR
CHECK RESISTORS CAPACITORS WHERE VOLTAGE IS ABNORMAL
DETECT THE POINT WHERE CLICK IS HEARD WHILE MOVING TESTER PROBE TO EACH TRANSISTOR BASE IN CLICK TEST
CHECK TRANSISTORS AND RESISTORS AT THE PRECEDING STAGE AND CHECK THE VOLTAGES

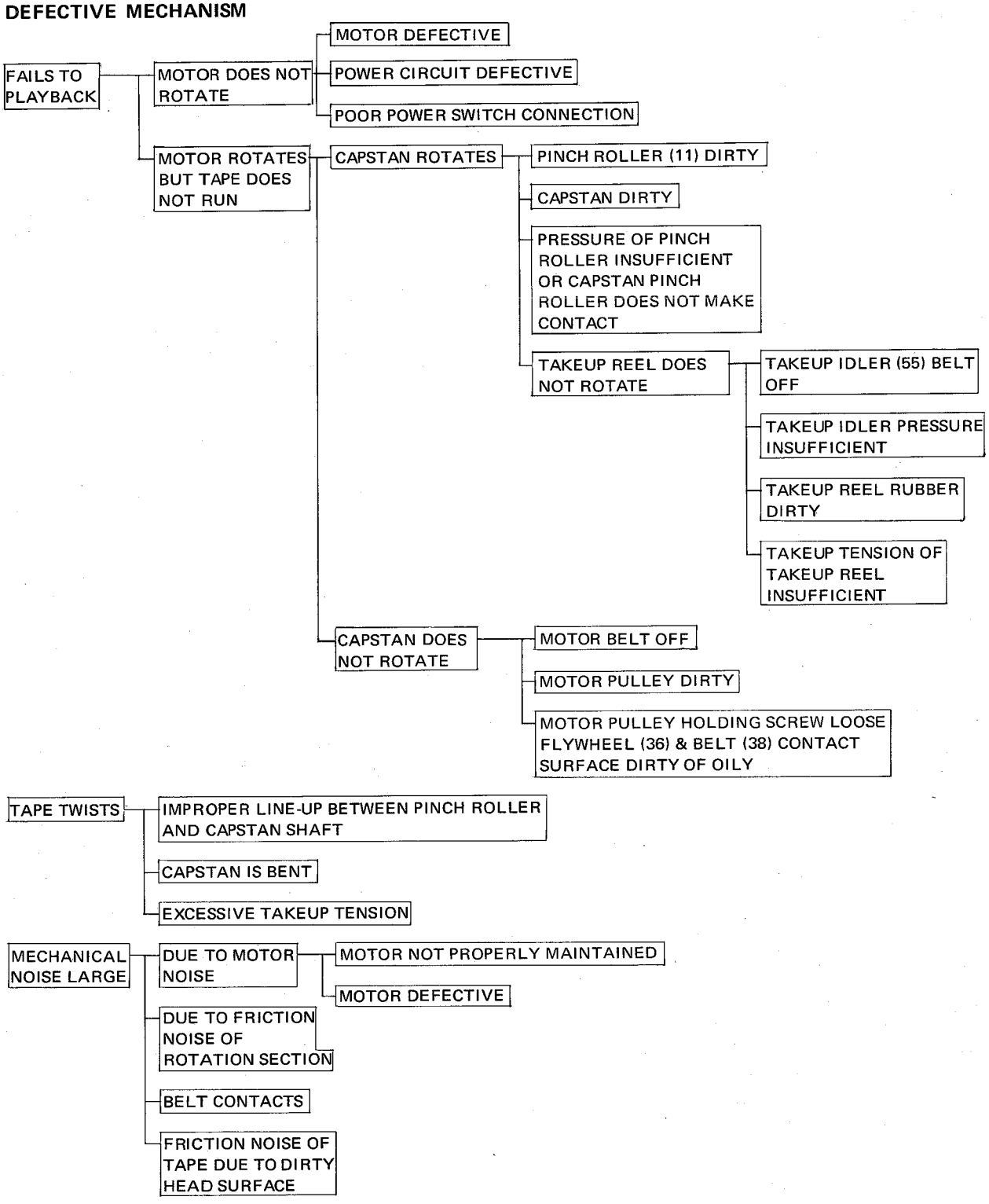
TROUBLE SHOOTING GUTDE 2

DEFECTIVE PLAYBACK CIRCUIT


TAPE PLAYBACK FREQUENCY RESPONSE IS UNSATISFACTORY
AZIMUTH MALADJUSTED
HEAD (18) IS DIRTY
EQUALIZER CIRCUIT DEFECTIVE
PLAYBACK EQUALIZER PARTS DEFECTIVE
INSUFFICIENT CONTACT OF SELECTOR SWITCH (S3)
TAPE SPEED TOO SLOW
PLAYBACK NOISE
ABNORMAL NOISE (TRANSISTOR NOISE, FLICKER NOISE)
FIRST STAGE TRANSISTOR DEFECTIVE
HUMMING
RECTIFIER DEFECTIVE
RIPPLE FILTER OR CAPACITOR DEFECTIVE
GROUND CIRCUIT DISCONNECTED (WIRE OR LUG)
DECOUPLING CAPACITOR LACKING IN CAPACITY
DOES NOT PLAYBACK AT ALL
APPLY TESTER PROBE ON S3-1 OR S3-4
CLICK IS HEARD
HEAD COIL BROKEN
NO CLICK IS HEARD
APPLY TESTER PROBE TO TR21 OR TR22 BASE
CLICK IS HEARD
R/P SWITCH FAILS IN CONTACT
BAD CONNECTION BETWEEN HEAD AND CIRCUIT BOARD, OR FAULT OF COUPLING CAPACITOR
CLICK IS NOT HEARD
APPLY TESTER PROBE ON EACH TR BASE TO DETECT THE POINTS WHERE CLICK IS HEAD AND CHECK PRECEDING PARTS
CHECK VOLTAGE OF TRANSISTORS
CHECK COUPLING CAPACITOR
CHECK VOLTAGE OF ALL TRANSISTORS
VOLTAGE NORMAL
SPEAKER DEFECTIVE
R/P SWITCH NOT MAKING CONTACT
COUPLING CAPACITOR DEFECTIVE
VOLTAGE ABNORMAL
SHORT-CIRCUIT OR DISCONNECTED PRIMARY SIDE OF INPUT TRANSFORMER
COLLECTOR RESISTER DEFECTIVE
EMITTER RESISTOR DEFECTIVE
BASE BLEEDER RESISTOR DEFECTIVE
THERMISTOR DEFECTIVE
POWER CIRCUIT DEFECTIVE
WEAK SOUND IN PLAYBACK
AZIMUTH MALADJUSTED
EMITTER CAPACITOR DEFECTIVE
VOLUME CONTROL DEFECTIVE
TONE CONTROL DEFECTIVE
HEAD DIRTY OR OUT OF ADJUSTMENT
SOUND DISTORTED PLAYBACK
INPUT TRANSFORMER DEFECTIVE
CAPACITORS & RESISTORS OF NFB CIRCUIT DEFECTIVE
SPEAKER DEFECTIVE OR HEAD PHONE JACK SHORTS OR FAILS TO MAKE CONTACT

TROUBLE SHOOTING GUIDE 3

DEFECTIVE MECHANISM


FAILS TO PLAYBACK
MOTOR DOES NOT ROTATE
MOTOR DEFECTIVE
POWER CIRCUIT DEFECTIVE
POOR POWER SWITCH CONNECTION
MOTOR ROTATES BUT TAPE DOES NOT RUN
CAPSTAN ROTATES
PINCH ROLLER (11) DIRTY
CAPSTAN DIRTY
PRESSURE OF PINCH ROLLER INSUFFICIENT OR CAPSTAN PINCH ROLLER DOES NOT MAKE CONTACT
TAKEUP REEL DOES NOT ROTATE
TAKEUP IDLER (55) BELT OFF
TAKEUP IDLER PRESSURE INSUFFICIENT
TAKEUP REEL RUBBER DIRTY
TAKEUP TENSION OF TAKEUP REEL INSUFFICIENT
CAPSTAN DOES NOT ROTATE
MOTOR BELT OFF
MOTOR PULLEY DIRTY
MOTOR PULLEY HOLDING SCREW LOOSE FLYWHEEL (36) & BELT (38) CONTACT SURFACE DIRTY OF OILY
TAPE TWISTS
IMPROPER LINE-UP BETWEEN PINCH ROLLER AND CAPSTAN SHAFT
CAPSTAN IS BENT
EXCESSIVE TAKEUP TENSION
MECHANICAL NOISE LARGE
DUE TO MOTOR NOISE
MOTOR NOT PROPERLY MAINTAINED
MOTOR DEFECTIVE
DUE TO FRICTION NOISE OF ROTATION SECTION
BELT CONTACTS
FRICTION NOISE OF TAPE DUE TO DIRTY HEAD SURFACE

EXPLODED VIEW OF CASSETTE DECK

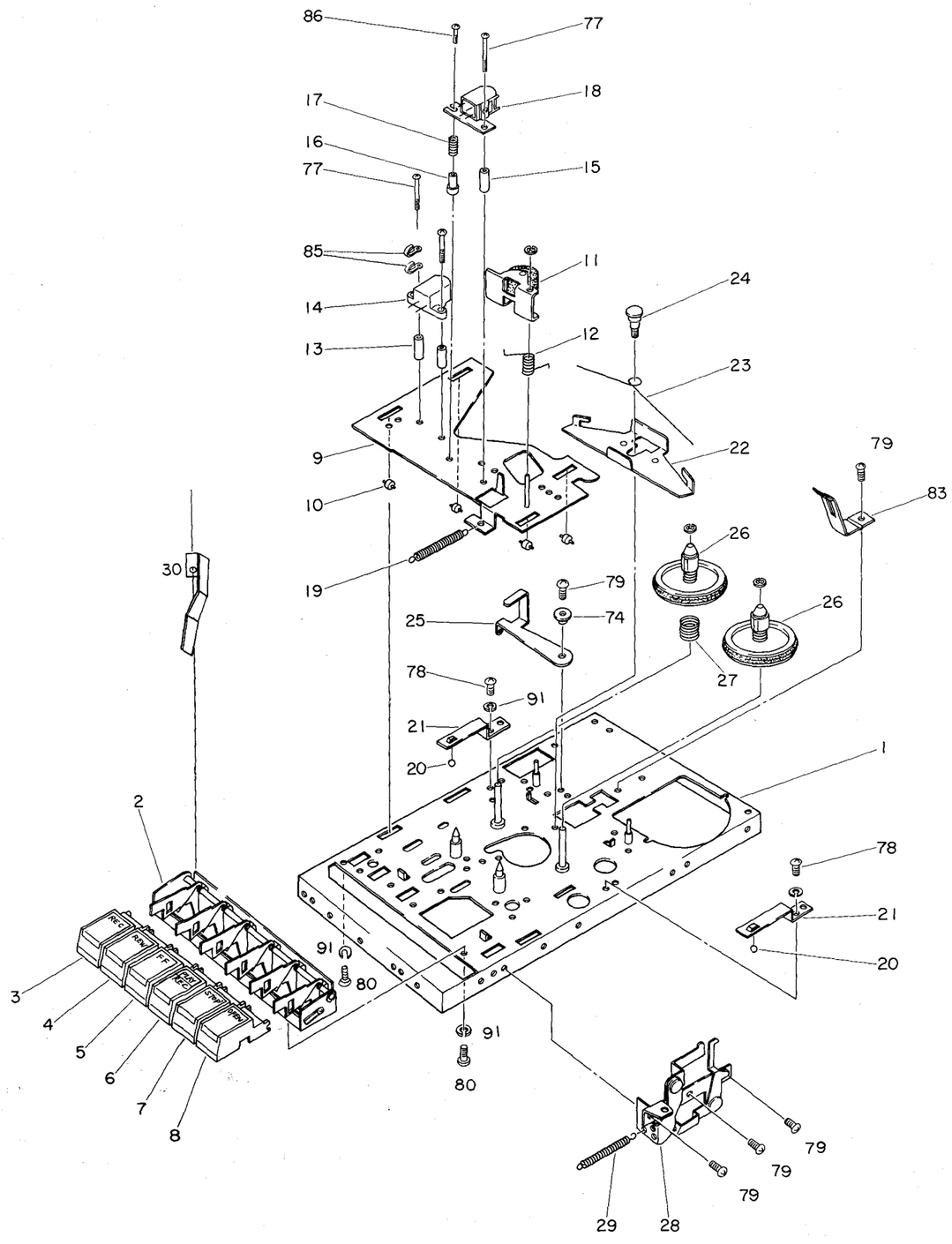


Fig. 40 TOP VIEW

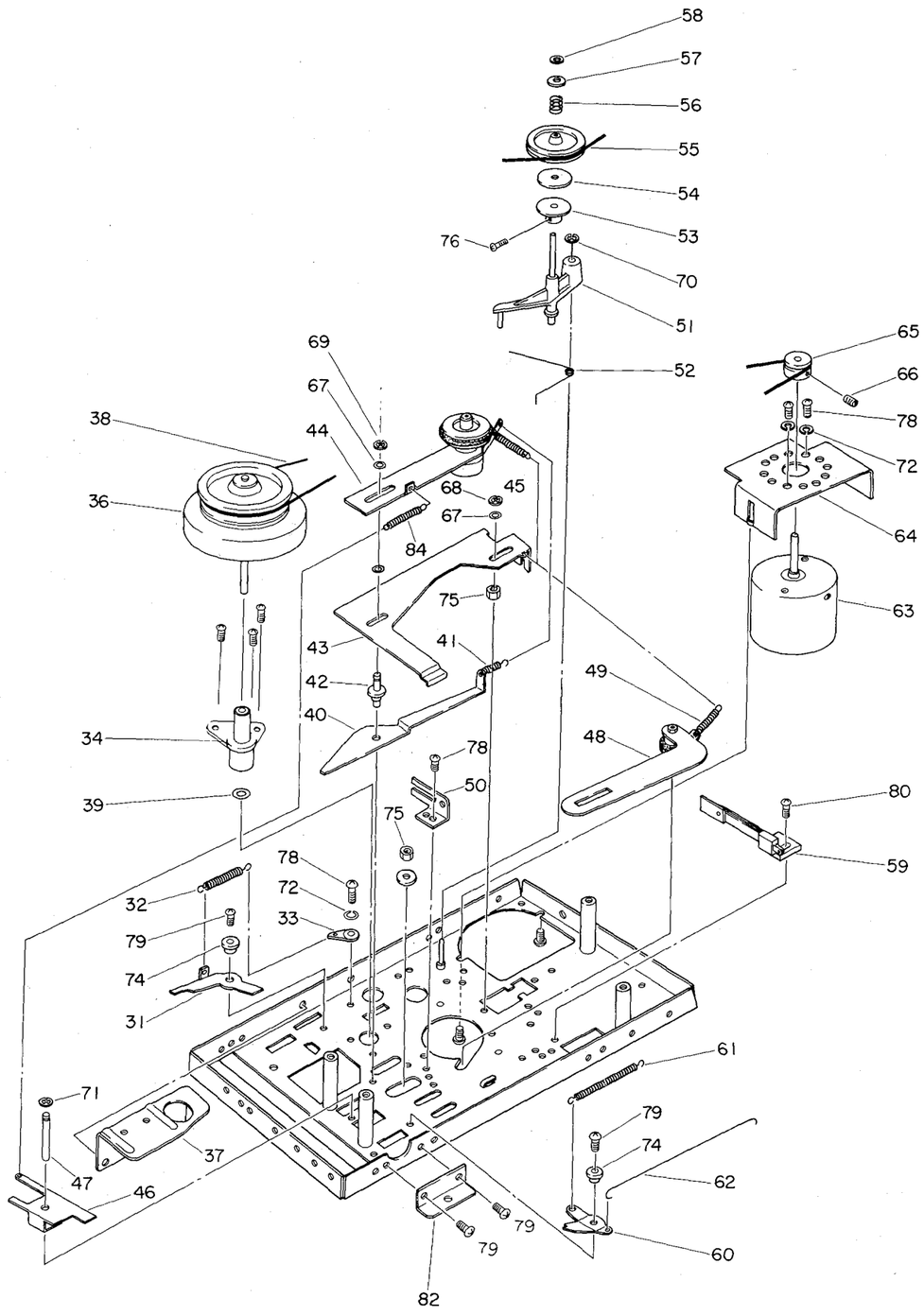


Fig. 41 BOTTOM VIEW

SERVICING THE RECORD CHANGER

SPECIFICATIONS

Operating Voltage . . . . . 120 Volts, AC
Turntable Speeds . . . . . 16-2/3, 33-1/3, 45 and 78 RPM
Record Load Capacity . . . . Up to six 7", 10" or 12" records with any intermix at same speed.

LUBRICATION

The record changer mechanism is well lubricated before leaving the Factory; after prolonged use, certain parts must be re-lubricated such as turntable shaft, cam gear assembly (cam only) and idler pulley shaft.

CAUTION

IT IS RECOMMENED THAT LUBRICATION BE DONE BY EXPERIENCED SERVICE TECHNICIANS ONLY.
A medium grease should be applied to the points as shown in Fig. 46.

ADJUSTMENT

Stylus Set-Down: During automatic operation the stylus sets down 1/8 inch from edge of record, Turning the stylus set down adjustment screw counter-clockwise causes the stylus to set down further in from the edge of the record. (See Fig. 43)
Pickup Arm Height: To raise, turn screw head by hand counterclockwise; to lower, turn screw head clockwise. Adjust stylus to clear a full stack of records by 1/8 inch. (See Fig. 43)
Stylus Pressure: The needle pressure is adjusted at the factory for the correct pressure of 6 grams. Move the spring to different holes to set different pressure. (See Fig. 43)

DISASSEMBLY INSTRUCTIONS

1. **Turntable Assembly**
   Remove Circlip and carefully lift Turntable Assembly off its bearing. When replacing Turntable Assembly, push the Idler Wheel Assembly towards the Turntable Center. This action will allow turntable to drop in position without damaging Idler Wheel.
2. **Record Support Arm Assembly**
   Make sure the Unit has completed its cycle and the Pickup Arm returned to the Arm Rest. Remove the Circlip and Washer from the bottom of the Record Support Arm Spindle. The Record Support Arm Assembly can then be removed from the top of the Unit.
3. **Pickup Arm Assembly**
   The Unit should be disconnected from Power supply before attempting to remove the Pickup Arm Assembly. The Pickup Arm leads should be detached from the Terminal. Remove the Pickup Arm Spindle Nut pull the Pickup Arm Assembly upward.
4. **Center Spindle Assembly**
   Move the Feed Link fully toward the Switch, then release. Remove the Center Spindle Assembly.
5. **Idler Wheel**
   Remove the turntable (step 1). Remove Circlip carefully and lift off the Idler Wheel. Replace new Idler Wheel carefully on shaft.
   DO NOT TOUCH OUTSIDE EDGE OF IDLER WHEEL OR LIFT IT CONTACT ANY OIL OR GREASE.

Note:
Please see note attached to exploded view of changer. (page 28)
Refer to FM-707A Service Manual for more detailed service information.

REPLACING CARTRIDGE AND STYLUS

Stylus
1. Lift the Pickup Arm to a position that will make the stylus accessible.
2. Gently remove Stylus and place new Stylus in to correct position as shown Fig. 45.

Cartridge
1. Lift the Pickup Arm to a position that will make the Cartridge accessible.
2. The leads are removed gently by pulling the connectors off the Cartridge terminals.
3. Gently remove Cartridge by spreading the Cartridge Holder spring as shown in Fig. 44.

SERVICING THE RECORD CHANGER

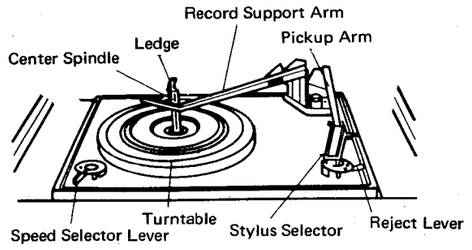


Fig. 42

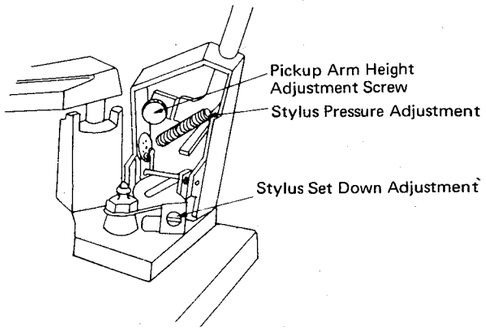


Fig. 43 PICKUP ARM ADJUSTMENT

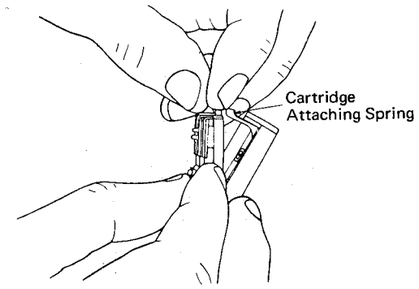


Fig. 44 REPLACING CARTRIDGE

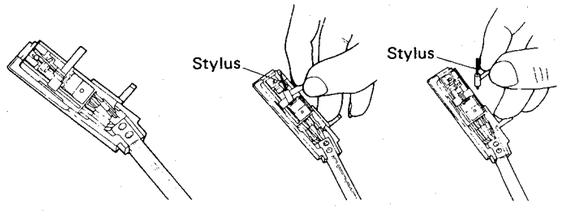


Fig. 45 REPLACING STYLUS

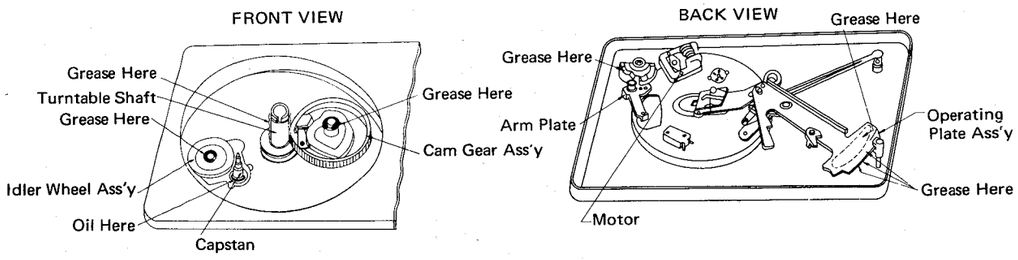
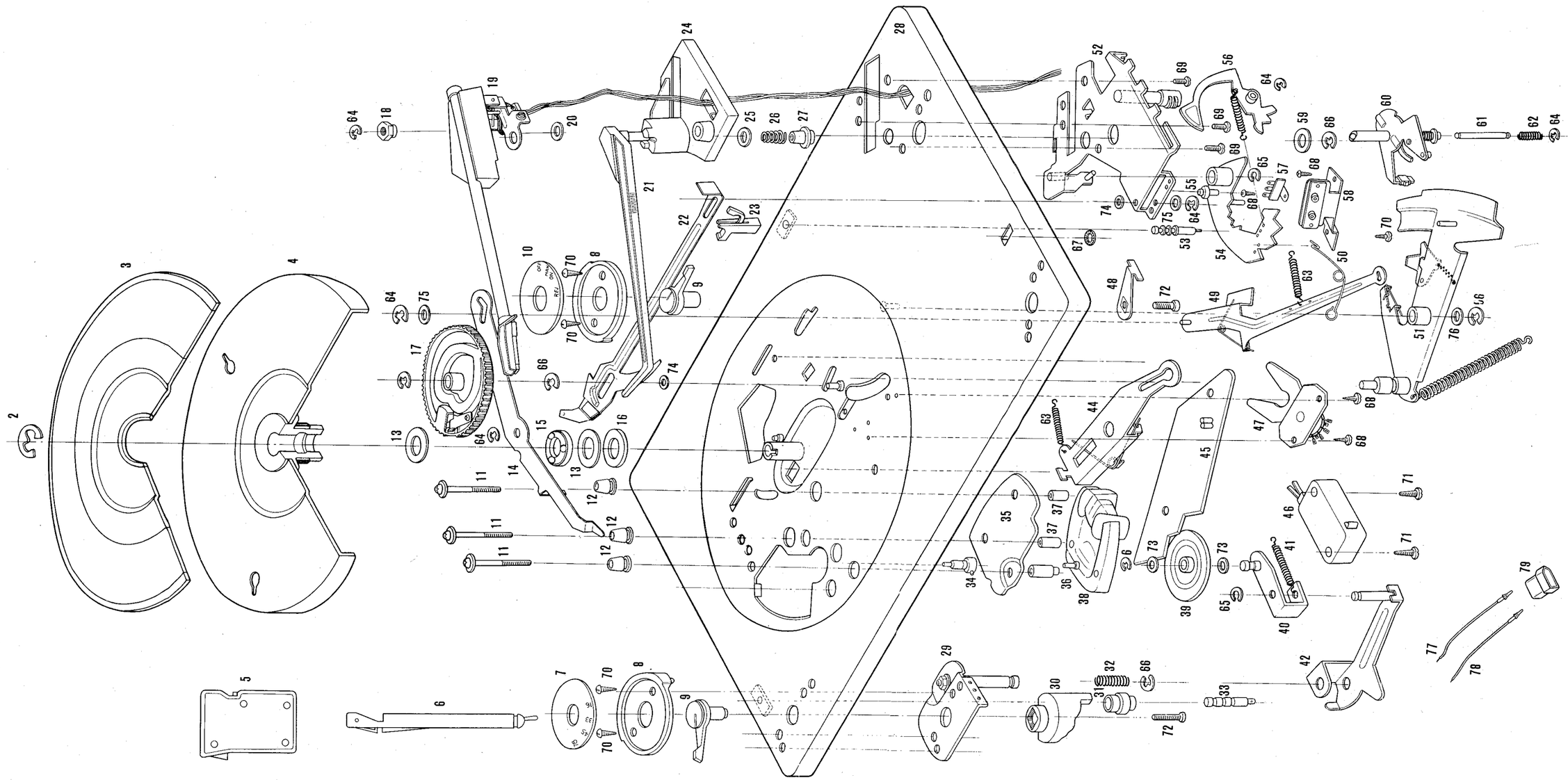


Fig. 46 LUBRICATION

EXPLODED VIEW OF RECORD CHANGER



RECORD CHANGER REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs.)	REMARKS
		Automatic Record Changer		
1	FA-707A	Automatic Record Changer	1	
2	FU-PWR009	Circlip	1	
3	FU-TCA013	Turntable Rubber	1	
4	FU-TTA048	Turntable Assembly	1	
5	FU-ADA005	45 RPM Adapter Complete	1	
6	FU-JSA004	Center Spindle	1	
7	FU-KKP036	Speed Change Label	1	
8	FU-MPL082	Escutcheon Moulding	2	
9	FU-KLE009	Lever, Speed & Reject	2	
10	FU-KKP035	Reject Lavel	1	
11	FU-JIK076	Joggle Screw	3	
12	FU-GBS044	Cushion Rubber	3	
13	FU-PWM018	T. T Washer	2	
14	FU-PZB081	Idler off Lever	1	
15	FU-PTD043	Ball Race Assembly	1	
16	FU-PWF009	Felt	1	
17	FU-GAA010	Cam Gear Assembly	1	
18	FU-JBS138	Nut (Pickup)	1	
19	EPU-13TTCD	Pickup Arm Assembly	1	
20	FU-PWF055	Washer, Pickup	2	
21	FU-ETA113	Record Support Arm Assembly	1	
22	FU-NPA012	Actuating Slide Assembly	1	
23	FU-RSA033	Pickup Arm Rest Assembly	1	
24	FU-MPL079	Record Support Housing	1	
25	FU-PWM049	Washer, Record Support	1	
26	FU-BWR081	Spring, Record Support	1	
27	FU-JBS150	Boss, Record Support	1	
28	FU-ETA110	Main Plate Assembly	1	
29	FU-ETA104	Arm Plate Holder Assembly	1	
30	FU-MPL078	Cam, Speed Change	1	
31	FU-GBS039	Rubber Cushion	4	
32	FU-BCP059	Spring (Arm Plate)	1	
33	FU-JSC086	Screw A, Rubber	3	
34	FU-CPC7H-5	Capstan	1	
35	FU-PSP042	Motor Plate Holder	1	
36	FU-JPC091	Stud A	1	
37	FU-FPC092	Stud B	2	
38	2E-10GPL	Motor Assembly	1	
39	FU-IPA010	Idler Wheel Assembly	1	
40	FU-UPA037	Idler Holder Assembly	1	
41	FU-BTN095	Spring (Idler Holder)	1	

RECORD CHANGER REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs.)	REMARKS
42	FU-UPA036	Arm Plate Assembly	1	
43		Not used		
44	FU-ETA105	Feed Link Assembly	1	
45	FU-PFT239	Switch Base Assembly	1	
46	AM-77909	Micro Switch	1	
47	ESL-1812	Short Switch Assembly	1	
48	FU-PDR013	Operation Lever A	1	
49	FU-ETA102	Operation Lever B	1	
50	FU-BWR096	Spring	1	
51	FU-ETA143	Operating Plate Asembly	1	
52	FU-PKA010	Main Sub Plate Assembly	1	
53	FU-JSC087	Screw B, Rubber Cushion	1	
54	FU-ETA142	Index Plate Assembly	1	
55	FU-GPL012	Rubber Cushion	1	
56	FU-ETA106	Selector Assembly	1	
57	FLPV-3N	Terminal	1	
58	FU-ETA133	Socket Holder Assembly	1	
59	FU-PWM059	Washer	1	
60	FU-ETA108	Pickup Plate-A Assembly	1	
61	FU-JIK060	Pickup Arm Raising Spindle Ass'y	1	
62	FU-BCP055	Magnet (Actuating Slide) Spring, Pickup Plate A	1	
63	FU-BTN084	Spring (Feed Link)	1	
64	ER-30S	Circlip	7	
65	ER-40S	Circlip	2	
66	ER-50S	Circlip	4	
67	OHW-30W	Toothed Lock Washer	1	
68	JMP-3060UF2	Self Tapping Screw	4	
69	JMP-3080UF2	Self Tapping Screw	6	
70	JMP-30100UF2	Screw	5	
71	JMP-30160UF2	Self Tapping Screw	2	
72	JMP-40120UF2	Self Tapping Screw	2	
73	FU-PWF062	Washer	2	
74	FU-PWF059	Washer, Actuating Plate	1	
75	KPW-40SB2	Washer	2	
76	FU-PWF019	Washer	1	
77	L18U17R475	Lead Wire A Red	1	
78	L18U17C475	Lead Wire B Brown	1	
79	EPG-1396P1	Plug Housing	1	
	ERD-12TK684	680kΩ 1/6 Watt ±10% Solid	2	
	ECK-D05100MY	10pF 50WV ±1pF Ceramic	2	
	EPC-34TTCD	Cartridge	1	
	ESP-13TTSD	Stylus (Diamond)	1	

CASSETTE TAPE RECORDER REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs.)	REMARKS
		Cassette Tape Recorder SM-50		
1	SMQ-222	Chassis Assembly	1	
2	SMQ-224	Push Button Assembly	1	
3	SYE-78	Button Assembly "REC"	1	
4	SYE-80	Button Assembly "REW"	1	
5	SYE-82	Button Assembly "FF"	1	
6	SYE-84	Button Assembly "PLAY"	1	
7	SYE-86	Button Assembly "STOP"	1	
8	SYE-88	Button Assembly "OPEN"	1	
9	SMQ-226	Head Panel	1	
10	SMQ-301	Pulley A	4	
11	SMQ-38	Pinch Roller Assembly	1	
12	SMQ-34	Spring C. Pinch Roller Ass'y	1	
13	SMQ-42	Stud A	2	
14	WY-223Z	Erase Head	1	
15	SMQ-228	Stud B, Record-Playback Head	1	
16	SMQ-230	Stud C, Record-Playback Head	1	
17	SMQ-232	Coil Spring A	1	
18	WY-425Z	Record/Playback Head	1	
19	SMQ-52	Spring D, Head Panel Action Bracket	1	
20	SMQ-54	Bearing	2	
21	SMQ-56	Head Panel Push Spring	2	
22	SMQ-164	Brake Arm	1	
23	SMQ-166	Spring E, Brake Arm	1	
24	SMQ-168	Pivot, Brake Arm	1	
25	SMQ-234	REC Safety Lever B	1	
26	SMQ-170	Reel Ass'y	2	
27	SMQ-186	Spring F, Reel	1	
28	SMQ-236	Pop-up Lever Assembly	1	
29	SMQ-240	Spring 1, Pop-up Lever	1	
30	SMQ-242	Switch Holding Spring Ass'y	1	
31	SMQ-142	Stop, Lever (OPEN)	1	
32	SMQ-146	Spring J, Stop	1	
33	SMQ-150	Lug	1	
34	SMQ-124	Shaft A Ass'y	1	
35		Not used		

CASSETTE TAPE RECORDER REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs.)	REMARKS
36	SMQ-128	Flywheel Assembly	1	
37	SMQ-244	Bracket Assembly	1	
38	SMQ-140	Belt, Capstan	1	
39	SMQ-148	Washer, Oil Thrower	1	
40	SMQ-58	Actuating Lever "FF"	1	
41	SMQ-72	Spring K, Actuating Lever "FF"	1	
42	SMQ-60	Shaft B, Brake Operating Plate	1	
43	SMQ-62	Brake Operating Plate	1	
44	SMQ-246	FF Idler Assembly	1	
45	SMQ-74	Spring L	1	
46	SMQ-248	FF Operating Plate	1	
47	SMQ-104	Shaft C, FF Operating Plate	1	
48	SMQ-90	REW Arm Assembly	1	
49	SMQ-92	Spring M, REW Arm Assembly	1	
50	SMQ-86	Holding Plate, FF Idler Ass'y	1	
51	SMQ-108	Takeup Arm	1	
52	SMQ-106	Spring N, Takeup Pulley	1	
53	SMQ-110	Clutch Wheel	1	
54	SMQ-112	Clutch Felt	1	
55	SMQ-114	Takeup Idler	1	
56	SMQ-116	Spring O, Takeup Idler	1	
57	SMQ-118	Cap, Takeup Idler	1	
58	SMQ-120	Washer, Cap	1	
59	SMQ-122	Motor ON-OFF Switch	1	
60	SMQ-152	REC Safety Lever A	1	
61	SMQ-154	Spring P, REC Safety Lever A	1	
62	SMQ-158	REC Safety Spoke	1	
63	SMQ-5SD9S	DC Motor	1	
64	MHT-5PS	Bracket C, DC Motor	1	
65	SMQ-198	Pulley, DC Motor	1	
66	XXA2A-3	Screw A, DC Motor	1	
67	SMQ-64	2ϕ Nylon Washer	3	
68	SNT-440	Circlip 1.2 m/m	2	
69	SNT-442	Circlip 1.5 m/m	3	
70	SNT-444	Circlip 1.9 m/m	2	
71	SNT-446	Circlip 2.3 m/m	1	

CASSETTE TAPE RECORDER REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs.)	REMARKS
72	XWA26B	Spring Washer	2	
73		Not used		
74	SMQ-162	Spacer B	2	
75	XNG-26B	Nut 2.6 m/m	2	
76	XSN17 + 4	Screw 1.7 mm x 4	1	
77	XSN2 + 12	Screw 2 mm x 12	3	
78	XSN26 + 3	Screw 2.6 mm x 3	7	
79	XSN26 + 4	Screw 2.6 mm x 4	8	
80	XSN26 + 6	Screw 2.6 mm x 6	6	
81		Not used		
82	SMQ-256	Bracket F, CH	1	
83	SMQ-258	Spring P, CH	1	
84	SMQ-260	Coil Spring	1	
85	SMQ-220	Lead Holder	1	
86	XSN2 + 5	Screw 2mm x 5	1	

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs.)	REMARKS
		TRANSISTORS		
TR1	2SK19	FM RF Amplifier (FET)	1	
TR2	2SC920	FM Mixer	1	
TR3	2SC829	FM Oscillator	1	
TR4	2SC829	Composite	1	
TR5	2SC829	19 kHz Amplifier	1	
TR6	2SA101	38 kHz Amplifier	1	
TR7	2SC829	DC Amplifier	1	
TR8	2SC178	Eye Switching	1	
TR9, 10	2SA564	Squelch & 1st AF Amplifier (L & R)	2	
TR11, 12	2SB346	2nd AF Amplifier (L & R)	2	
TR13, 14	2SB176	Driver (L & R)	2	
TR15, 16, 17, 18	2SB473	Power Output (L & R)	4	
TR19	2SB175	AC Bias Oscillator	1	
TR20	2SB324	AC Bias Amplifier	1	
TR21, 22	2SB346	Equalizer Pre Amplifier (L & R)	2	
TR23, 24	2SB175	Equalizer Pre Amplifier (L & R)	2	

REPLACEMENT PARTS LIST (Cont'd)

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs.)	REMARKS
		INTEGRATED CIRCUIT		
	AN-203	FM 1st-3rd IF Amp. & AM Converter AM 1st & 2nd IF Amp.	1	New
		DIODES		
D1	SC-15	AFC	1	
D2	0A90	AM D. AGC	1	
D5	0A90	AM Detector	1	
D7, 8	0A90	FM Detector (pair)	2	
D9, 10	0A90	Doubler (pair)	2	
D11, 12, 13, 14	0A90	FM MPX (two pairs)	4	
D15	1S1211	Rectifier	1	
D16, 17	0A90	Level Meter Det	2	
D18	10DC-1	Rectifier	1	
D19	10DC-1R	Rectifier	1	
D20	12B-2-BIP-M	Rectifier	1	
		THERMISTORS		
TH1 ~4	ERT-D2FGK750S	Temperature Compensator	4	
TH5	MT-10K	Temperature Compensator	1	
		INDICATOR		
	SSM-4	Level Meter	1	New
		COILS AND TRANSFORMERS		
L1	SLA-4P4	FM Antenna Coil	1	
L2	SLD-4Y2	FM Collector Coil	1	
L3	SLQ-Y11G-2	FM IF Trap Coil	1	
L4	SLO-4Y2	FM Oscillator Coil	1	
L5	SLF-2E12	AM Ferrite Antenna Coil	1	New
L6	SLO-2C12M	AM Oscillator Coil	1	
L7, 8	SLQ-V394-2Y	MPX Filter	2	
L9	SLT-6E2-D	Choke Coil	1	
L10, 11, 12, 13	RLQ-C542-1	Bias Trap Coil	4	
L14, 15	SLQ-Y35G-2D	Radio Frequency Coil	2	
L16, 17	ELQ-250A999	Noise Filter Coil	2	
T1, 2	SLI-4B102	FM 1st & 2nd IFT	2	
T3	SLI-4C32M	FM 3rd IFT	1	
T4	SLI-2C22M	AM 1st IFT	1	
T5, 7	SLI-4C22M	FM 4th & 5th IFT	2	

* D3, 4, 6 are not used.

REPLACEMENT PARTS LIST (Cont'd)

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs.)	REMARKS
T6	SLI-2C14M	AM 2nd IFT	1	
T8	SLI-4C56	FM Discriminator IFT	1	
T9	SLI-4C58	FM Discriminator IFT	1	
T10	SLI-2C48M	AM 3rd IFT	1	
T11	SLM-2C4K	MPX 19kHz Coil	1	
T12	SLM-2C2K	MPX 19kHz Coil	1	
T13	SLM-3C2K	MPX 38kHz Coil	1	
T14	RLD-9C2-T	AC Bias Oscillator	1	
T15, 16	SLT-3H4-D	Input Transformer	2	
T17	SLT-5W2-D	Power Transformer	1	New
COMPONENT COMBINATION				
M1	EXA-F203Z471	0.02μFZ, 470Ω (two)	1	
M2	EXA-5DL04C	4.7kΩ (two), 330pF (three)	1	

RESISTORS							REMARKS					
							RF	IF	AF	P.S	TR	CH
R67,115,116	ERD-14VJ220	22Ω	1/4Watt	±5%	Carbon	3			2		1	
R17, 18, 19, 122,124,125, 127	ERD-14VJ270	27Ω	1/4Watt	±5%	Carbon	7		3	4			
R10	ERD-14VJ470	47Ω	1/4Watt	±5%	Carbon	1	1					
R96, 102	ERD-14VJ560	56Ω	1/4Watt	±5%	Carbon	2			2			
R12	ERD-14VJ121	120Ω	1/4Watt	±5%	Carbon	1	1					
R20,30,37,38, 45, 66, 103, 104,167,168	ERD-14VJ101	100Ω	1/4Watt	±5%	Carbon	10		5	2		3	
R11, 22, 30, 119,120,152	ERD-14VJ221	220Ω	1/4Watt	±5%	Carbon	6	1	2	2			1
R16, 21, 92, 99,113,114, 117,118,140, 141,151	ERD-14VJ331	330Ω	1/4Watt	±5%	Carbon	11		2	6	1		2
R3	ERD-14VJ471	470Ω	1/4Watt	±5%	Carbon	1	1					
R9, 82, 88, 101,105,154	ERD-14VJ561	560Ω	1/4Watt	±5%	Carbon	6	1		4			1
R46	ERD-14VJ681	680Ω	1/4Watt	±5%	Carbon	1		1				
R23, 24, 40, 50, 51, 52, 53, 56, 59, 62, 65	ERD-14VJ102	1kΩ	1/4Watt	±5%	Carbon	11		9			2	
R121,123,126, 128	ERD-14VJ122	1.2kΩ	1/4Watt	±5%	Carbon	4			4			
R74, 77, 78	ERD-14VJ152	1.5kΩ	1/4Watt	±5%	Carbon	3					3	
R34,133,136	ERD-14VJ182	1.8kΩ	1/4Watt	±5%	Carbon	3		1	2			
R4,47,54,55, 57,58,70, 71,165,166, 171,173,174	ERD-14VJ222	2.2kΩ	1/4Watt	±5%	Carbon	13	1	5			7	
R39	ERD-14VJ272	2.7kΩ	1/4Watt	±5%	Carbon	1		1				

REPLACEMENT PARTS LIST (Cont'd)

REF. NO.	PART NO.	DESCRIPTION				PER SET (pcs)	REMARKS					
							RF	IF	AF	P.S	TR	CH
R35,72,73	ERD-14VJ332	3.3kΩ	1/4Watt	±5%	Carbon	3		1			2	
R100, 106	ERD-14VJ392	3.9kΩ	1/4Watt	±5%	Carbon	2			2			
R6,42,86, 89,143,145	ERD-14VJ472	4.7kΩ	1/4Watt	±5%	Carbon	6	1	1	2		2	
R5,60,61,110, 111,160,176	ERD-14VJ562	5.6kΩ	1/4Watt	±5%	Carbon	7	2	3	2			
R76, 79	ERD-14VJ682	6.8kΩ	1/4Watt	±5%	Carbon	2					2	
R81	ERD-14VJ822	8.2kΩ	1/4Watt	±5%	Carbon	1			1			
R27,28,94, 97,109,117, 163,164	ERD-14VJ103	10kΩ	1/4Watt	±5%	Carbon	8		2	4		2	
R48,49,68, 69,161,162	ERD-14VJ183	18kΩ	1/4Watt	±5%	Carbon	6		2			4	
R7	ERD-14VJ223	22kΩ	1/4Watt	±5%	Carbon	1	1					
R63	ERD-14VJ273	27kΩ	1/4Watt	±5%	Carbon	1					1	
R169,170	ERD-14VJ333	33kΩ	1/4Watt	±5%	Carbon	2					2	
R41	ERD-14VJ473	47kΩ	1/4Watt	±5%	Carbon	1		1				
R8	ERD-14VJ683	68kΩ	1/4Watt	±5%	Carbon	1	1					
R93,98,135, 179	ERD-14VJ823	82kΩ	1/4Watt	±5%	Carbon	4			4			
R13,26,75,80	ERD-14VJ104	100kΩ	1/4Watt	±5%	Carbon	4	1	1			2	
R31,134,137	ERD-14VJ154	150kΩ	1/4Watt	±5%	Carbon	3		1	2			
R2,14	ERD-14VJ224	220kΩ	1/4Watt	±5%	Carbon	2	2					
R32	ERD-14VJ274	270kΩ	1/4Watt	±5%	Carbon	1		1				
R36	ERD-14VJ334	330kΩ	1/4Watt	±5%	Carbon	1		1				
R1, 15	ERD-14VJ474	470kΩ	1/4Watt	±5%	Carbon	2	1	1				
R83, 84	ERD-14VJ105	1MΩ	1/4Watt	±5%	Carbon	2			2			
R155, 156	ERD-14TJ100	10Ω	1/4Watt	±5%	Carbon	2					2	
R44	ERD-14TJ221	220Ω	1/4Watt	±5%	Carbon	1						1
R29	ERD-14TJ102	1kΩ	1/4Watt	±5%	Carbon	1		1				
R172	ERD-14TJ222	2.2kΩ	1/4Watt	±5%	Carbon	1					1	
R177, 178	ERD-14TJ184	180kΩ	1/4Watt	±5%	Carbon	2						2
R82,85,153	ERC-12GK155	1.5MΩ	1/2Watt	±10%	Solid	3			2			1
R129,130,131, 132	ERW-12L1R5	1.5Ω	1/2Watt	±10%	Wire	4			4			
R138,139,149, 150	ERX-2PSK180	18Ω	2Watt	±10%	Wire	4			2		2	
R148	ERD-1PZK680	68Ω	1Watt	±10%	Carbon	1				1		
CAPACITORS												
C7,9,145	ECC-D05010C	1pF	50WV	±0.25pF	Ceramic	3	3					
C5, 30	ECC-D05040C	4pF	50WV	±0,25pF	Ceramic	2	1	1				
C3,16,135	ECC-D05050C	5pF	50WV	±0.25pF	Ceramic	2	2					
C1,12	ECC-D05070D	7pF	50WV	±0.5pF	Ceramic	1	1					

REPLACEMENT PARTS LIST (Cont'd)

REF. NO.	PART NO.	DESCRIPTION				PER SET (pcs)	REMARKS					
							RF	IF	AF	P.S	TR	CH
C14, 15	ECC-D05120K	12pF	50WV	±10%	Ceramic	1	1					
C1	ECC-D05180K	18pF	50WV	±10%	Ceramic	1	1					
C11	ECC-D05150K	15pF	50WV	±10%	Ceramic	1	1					
C29	ECC-D05470K	47pF	50WV	±10%	Ceramic	1		1				
C40	ECC-D05820K	82pF	50WV	±10%	Ceramic	1		1				
C31	ECC-D05331K	330pF	50WV	±10%	Ceramic	1		1				
C15	ECC-D05120K	12pF	50WV	±10%	Ceramic	1	1					
C39,70,71	ECQ-S02121JZ	120pF	50WV	±5%	Styrol	3		1			2	
C6	ECQ-S02181KZ	180pF	50WV	±10%	Styrol	1	1					
C134	ECQ-S05271JZ	270pF	50WV	±5%	Styrol	1		1				
C72,73,120, 133	ECQ-S02152KZ	1500pF	50WV	±10%	Styrol	4		2			2	
C43,54,55, 57,58,63	ECQ-S02182JZ	1800pF	50WV	±5%	Styrol	6		5			1	
C56, 59	ECQ-S02392JZ	3900pF	50WV	±5%	Styrol	2		2				
C42, 45	ECQ-S02472KZ	4700pF	50WV	±10%	Styrol	2		2				
C10,16,17, 21,27,37	ECK-D05223ZV	0.022μF	50WV	+80%, −20%	Ceramic	6	2	4				
C8,121,127, 128,129,130	ECK-D05103PJ	0.01μF	50WV	+100%, −0%	Ceramic	6	1	1		4		
C19,20,25	ECK-D05103MY	0.01μF	50WV	±20%	Ceramic	3		3				
C2,4,13	ECK-D05102MY	0.001μF	50WV	±20%	Ceramic	3	3					
C24	UKD-12J223M	0.022μF	50WV	±20%	Ceramic	1		1				
C131	BP-21	100pF	1400WV	+100%, −0%	Mica	1						1
C142, 143	ECQ-M05102M	0.001μF	50WV	±20%	Polyester	2					2	
C85, 86	ECQ-M05332MZ	0.0033μF	50WV	±20%	Polyester	2					2	
C77,78,111, 117	ECQ-M05682MZ	0.0068μZ	50WV	±20%	Polyester	4			2		2	
C44,145,147	ECQ-M05103MZ	0.01μF	50WV	±20%	Polyester	3		1	2			
C41,46,52,53	ECQ-M05223MZ	0.022μF	50WV	±20%	Polyester	4		4				
C67,83,84	ECQ-M05333MZ	0.033μF	50WV	±20%	Polyester	3					3	
C66	ECQ-M05104MZ	0.1μF	50WV	±20%	Polyester	1					1	
C92, 93	ECQ-M05472MZ	0.047μF	50WV	±20%	Polyester	2			2			
C74, 75	ECQ-M05222MZ	0.0022μF	50WV	±20%	Polyester	2					2	
C22,109,111	ECE-A6V10N	10μF	6WV		Electrolytic	3		1	2			
C18,87,88,100, 103,140,141	ECE-A6V47N	47μF	6WV		Electrolytic	7	1		2		4	
C36,65,112, 113	ECE-A6V220N	220μF	6WV		Electrolytic	4		1	2		1	
C91,136	ECE-A25V4R4N	4.7μF	25WV		Electrolytic	2		1	1			
C64	ECE-A10V100N	100μF	10WV		Electrolytic	1					1	
C26,80,96,99, 106,107,123	ECE-A10V220N	220μF	10WV		Electrolytic	7		1	4	1	1	
C114, 115	ECE-A16V220N	220μF	16WV		Electrolytic	2			2			

REPLACEMENT PARTS LIST (Cont'd)

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs)	REMARKS					
				RF	IF	AF	P.S	TR	CH
C124	ECE-A16V470N	470μF 16WV Electrolytic	1				1		
C125, 126	ECE-B16V2200	2200μF 16WV Electrolytic	2				2		
C47, 132	ECE-A25V1N	1μF 25WV Electrolytic	2		1				1
C50,51,76,79, 81,82,94,95, 97,98	ECE-A25V3.3N	3.3μF 25WV Electrolytic	10		2	4		4	
C61,62,104, 105	AL-10V0.1M	0.1μF 10WV Electrolytic	4			2		2	
C101, 102	AL-10V0.33M	0.33μF 10WV Electrolytic	2			2			
		VARIABLE RESISTORS							
VR1, 2	EVB-Q1AA01A54	50kΩ Volume Control (R90, 91)	1						
VR3, 4	EVB-Q0AA01D14	10kΩ Tone Control (R107, 108)	1						
VR5	EVA-Q0AA01G15	100kΩ Balance Control (R95)	1						
VR6	EVL-S0AA00B13	1kΩ FM Separation Adjust (R33)	1						
VR7	EVL-T0AA00B23	2kΩ AC Bias Control (R64)	1						
		VARIABLE CAPACITORS							
CT1, 2, 4	ECV-5XR27B18S	Tuning Capacitor	1						
CT3, 5	ECV-1ZW101P12	Trimmer Capacitor	1						
		SWITCHES							
SB1 ~ 8	ESR-E283L15BE	Band Selector Switch	1						
SF1 ~ 8	ESR-E283L15BE	Function Selector Switch	1						
S3	SSH-20	"PLAY-REC" Switch	1						
S4	EST-1030DU	Power Switch	1						
S5	SSH-16	AFC Switch	1						
		SPEAKERS							
SP1 ~ 2	EAS-16P24SF	6-1/2" PM Dynamic Speaker, 16Ω	2						
		MISCELLANEOUS							
	SUZ-68	Guide, Dial Pointer	1						
	SHR-718	Cushion. Level Meter	1						
	SDD-3030	Drum	1						
	SDD-9002	Cover, Drum	1						
	SDX-606	Drum Shaft	1						
	RDG-7	Gear A	1						
	RDG-6	Gear B	1						
	RDS-205	Gear Spring	1						
	RDS-309	Drum Spring	2						
	RHG-6	Rubber Cushion, Tuning Capacitor	5						
	SDT-1324	Tuning Shaft	1						

REPLACEMENT PARTS LIST (Cont'd)

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs)	REMARKS
	RDY-8	Pulley Shaft	2	
	RDY-13	Pulley Shaft	2	
	RDR-8	Pulley	1	
	RDR-13	Pulley	2	
	RDR-14	Pulley D	4	
	SYE-2	Dial Pointer Ass'y	1	
	SUS-72	Plate Spring, Dial Pointer	1	
	SDA-4	Holder B, Dial Pointer	1	
	SGK-276	Stereo Indicator	1	
	SJE-76	Jack Plate	1	
	SNE-905	Rivet, Jack Plate	4	
	RJP-5	Pin Plug	2	
	SJP-36	2 Pin Socket, Stereo Eye	1	
	RJJ-25	M2 Jack	2	
	SJJ-32	Headphone Jack	1	
	XAN43T	Pilot Lamp	2	
	SWE-4	Pilot Lamp Ass'y	1	
	SWJ-38	Changer Power Lead	1	
	SWJ-40	Cassette Connecting Lead	1	
	XSN3+6RS	Screw, Chassis M'tg	7	
	SPN-1026	Filler A	1	
	SPN-1028	Filler B	1	
	SQX-5366	Instruction Book	1	
		APPEARANCE		
	WM-2201N	Microphone	1	
	WN-123N	MIC Stand	1	
	SYK-708	Top Cover, Complete	1	New
	SYK-710	Main Cabinet, Complete	1	New
	SYU-166	Bottom Cover, Complete	1	New
	SKE-198	MIC Jack Holder	1	
	SGE-274	Translucent Plate	1	
	SGX-534	Trim A, Translucent Plate	1	
	SGX-530	Trim B, Right Side	1	
	SGX-532	Trim C, Left Side	1	
	SGK-270	Trim D, Switch	1	
	SGK-272	Trim E, Volume	1	

REPLACEMENT PARTS LIST (Cont'd)

REF. NO.	PART NO.	DESCRIPTION	PER SET (pcs)	REMARKS
	SYP-32	Panel Ass'y	1	New
	SYK-706	Speaker System Complete	2	
	SGX-510	Trim A, Speaker Cabinet	4	
	SGX-512	Trim B, Speaker Cabinet	4	
	SGX-514	Trim C, Speaker Cabinet	4	
	SKD-2600	Dial Plate	1	New
	SDH-108	Dial Back Plate	1	
	SBN-348	Knob, Tuning	1	
	SBN-310	Knob, Volume	3	
	SBN-308	Knob, Selector	2	
	SGX-386	Cover, Power Switch	1	
	SHG-314	Rubber Foot, Bottom Cover	4	

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	
		CABINET	
1	SYK-686	Main Cabinet Assembly	Main Cabinet, Complete (SYK-710)
2	SGK-274	Jack Indicator	
3	SYP-32	Panel Assembly	
4	SYU-164	Bottom Cover Assembly	Bottom Cover, Complete (SYU-166)
5	SGN-420	Specification Plate	
6	SYK-708	Top Cover	
7	SYK-706	Speaker System, Complete without Speaker	